S0497-1-U

THE PRIMARY COPPER INDUSTRY OF ARIZONA IN 1989

DEPARTMENT OF MINES AND MINERAL RESOURCES

BY RICHARD R. BEARD

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

Leroy E. Kissinger, Director

Phoenix Office:
Mineral Building, Fairgrounds
Phoenix, Arizona 85007
(602) 255-3791
Toll Free in Arizona: 800-446-4259

Tucson Office:
416 W. Congress, Rm. 162
Tucson, Arizona 85701
Office open Monday and Tuesday
(602) 628-6340

BOARD OF GOVERNORS

Clifford B. Altfeld - Tucson
Chairman

Roy Miller - Phoenix
Secretary

Edna Vinck - Globe
Vice Chairman

Arthur H. Kinneberg - Phoenix
Member

C. J. Hansen - Tucson
Member

Cover: Copper cathodes from Ray's SX-EW plant.

STATE OF ARIZONA
DEPARTMENT OF MINES AND MINERAL RESOURCES

Leroy E. Kissinger, Director

THE PRIMARY COPPER INDUSTRY OF ARIZONA IN 1989

Special Report No. 16

by

Richard R. Beard, Mining Engineer

October, 1990

ACKNOWLEDGEMENT

The author wishes to express his sincere appreciation to the management and staff of each of Arizona's mining companies for graciously devoting time and effort to provide information for this report. Lorraine Burgin and Michael Greeley of the U.S. Bureau of Mines, Dr. George Leaming of the Western Economic Analysis Center of Marana, Arizona, and the American Bureau of Metal Statistics, Inc. of Secaucus, New Jersey also provided vital information.

Thanks are also due to the Arizona Department of Economic Security, the Arizona Department of Revenue, and the staff of the Joint Legislative Budget Committee for providing statistics and data.

A special gratitude is felt toward the preceding authors for providing the format and sources of statistical information, to Leroy E. Kissinger, Director of the Department of Mines and Mineral Resources, for providing the opportunity to author this report, and to Diane Bain for her editing and desktop publishing efforts.

TABLE OF CONTENTS

INTRODUCTION 1
COPPER PRODUCTION IN ARIZONA - 1989 3
1989 OPERATIONS SUMMARY 4
STATUS AND PROGRESS 6
HIGHLIGHTS OF COMPANY OPERATION IN ARIZONA
Arimetco 10
Asarco 10
Cyprus Minerals Company 12
Kocide Mining Corp. 15
Magma Copper Company 15
Phelps Dodge Corporation 17
SEVERENCE TAX ON METALLIFEROUS MINERALS 19
PROPERTY TAX 22

STATISTICAL TABLES *

PRODUCTION
Arizona
Table I — Copper and Molybdenum Production of Large Arizona Copper Mines, 1989 24
Table II — Arizona Leach Copper Production 28
Table III — Rank of Arizona's Copper Companies by Production of Copper and Molybdenum, 1989 30
Table IV — Rank of Arizona's Copper Mines by Production of Copper and Molybdenum, 1989 31
Table V — Arizona Mine Production of Recoverable Copper by Month and Cumulative Year to Date, 1985-89 32
Table VI — Average Copper Content of Ore Produced at Arizona Copper Mines, 1980-89 33
Table VII — Percent Contained Copper Recovered at Arizona Copper Mines, 1980-89 35
Table VIII — Stripping Ratios at Arizona Open-Pit Copper Mines (Waste:Ore), 1980-89 37
Table IX — Arizona Production and Value of Copper, Molybdenum, Gold, and Silver Recovered from Copper Ore, 1973-89 39
Table X — Nonfuel Mineral Production in Arizona 42
Table XI — Copper Mine Capacity in Arizona 43
United States
Table XII — Copper Smelters in North America 44
Table XIII — Copper Production of Companies in the U.S. 45
Table XIV — Copper Imports of the U.S. by Country 46
Table XV — Copper Exports of the U.S. by Country 50
EMPLOYMENT
Arizona
Table XVI — "Covered Employment" and Wages in Arizona Copper Mining and Smelting 54
Table XVII — Arizona Industries Covered by Social Security Year - 1989 56
Table XVIII — Direct and Indirect Impacts of the Copper Industry on the Arizona Economy - 1989 57

United States

Table XIX — Employment, Earnings and Hours in Copper Mining in the United States and Arizona, 1971-89 58

INVENTORIES

Table XX — Refined Copper Inventories at Month End 1983-89 62

PRICES

Table XXI — Average Quoted Price of Electrolytic Copper Wirebar - Domestic, Delivered 1980-89 63

COSTS

Table XXII — Average Copper Cash Production Costs for the United States. 1983-88 64

RESERVES

Table XXIII — Copper Reserve Base in Arizona 65

Copper Reserves - Listed by Company 73

Table XXIV — Arizona and U.S. Copper Mine Production in Short Tons of Copper, 1875-89 74

ILLUSTRATIONS

Figure 1 — Map of Producing Copper Properties, 1989 2

Figure 2 — Graph of Copper Prices, 1930 - 89 5

Figure 3 — Graph of Copper Produced (Recoverable Content), 1971 - 89 61

Figure 4 — Graph Showing Productivity of Arizona Copper Workers, 1971 - 89 61

Figure 5 — Map Showing Copper Reserves, 1989 72

* Throughout this report a "ton" means a short ton (2,000 pounds or 0.90718 metric ton).

Specific statistics may vary slightly from table to table due to differences in source data.

INTRODUCTION

The Arizona Department of Mines and Mineral Resources presents herein a report covering activity in Arizona's copper industry in the calendar year 1989. A brief review of operational highlights reported by the major developers and producers in the State, market and price developments that affected copper production, and discussions of Arizona severance taxes on metalliferous minerals are included.

The contained statistical tables include various production, employment, inventory, import/export, prices, costs, and ore reserve numbers for 1989. Production of recoverable copper is given for individual mines and by company. Figures showing the importance of copper in the mining industry are provided, as are data on the by-products of copper mining; gold, silver, and molybdenum. In addition, historical compilations are included for leach copper, average grade of ore produced, percent copper recovered, open pit mine stripping ratios, and employment and earnings. Additional compilations indicating refined copper inventories in and out of the United States and average copper prices by month from 1980 through 1989 are provided. Also included are tables showing designed mine capacity and copper reserves in Arizona plus average copper cash production costs for the United States, 1983-1988.

The Department maintains extensive reference libraries in its Phoenix and Tucson offices concerning the copper industry in Arizona. These repositories include information on individual mines and mining companies, United States Bureau of Mines and United States Geological Survey publications, other professional publications, periodicals, and earlier editions of this report. Additionally, experienced mining engineers are available for consultation, at no charge, on matters germane to the minerals industry. Office hours are 8 a.m. to 5 p.m. on all non-holiday weekdays in Phoenix and on Mondays and Tuesdays in Tucson.

Figure 1. PRODUCING COPPER PROPERTIES
1989

COPPER PRODUCTION IN ARIZONA - 1989

Arizona's copper industry produced 1,004,891 tons of copper in 1989 (Table I). This is an increase of 6.7% above 1988, but is still 8.8% below the record production of 1981 (Table IX). Arizona's share of the United States total was up to 60.8% from 59.5%.

The gross value of non-fuel mineral production in Arizona in 1989 was up 15% above 1988 to $3,190,266 (Table X) as copper prices remained firm. Copper production represents 81.3% of this total; the by-products of copper production (gold, silver and molybdenum) represent an additional 4.8% (Table IX). The total contribution of the copper mines was therefore 86.1% of the gross value.

Copper was produced by 6 companies from 14 properties in 1989 and molybdenum was recovered as a co-product or by-product at 5 of these properties (Tables III & IV). Eight properties produced 98.9% of Arizona's copper and 3 produced 89.4% of the molybdenum. The Morenci-Metcalf mine of Phelps Dodge led in copper production with 30.1% of the total. The Sierrita- Esperanza complex produced 50.0% of the molybdenum.

More than 250,000 tons of copper representing 24.9% of the total was produced by leaching in 1989. Solvent extraction-electrowinning produced almost 238,000 tons of cathode copper from these leach solutions. The remaining 12,000 tons were precipitated as cement copper (Table I).

Stripping of waste, including some leachable material, was accomplished at the 9 operating open pit mines during 1989. The weighted average of the stripping ratios - waste to ore - was 1.46 to 1 (Table VIII). This is comparable to the 1.49 to 1 in 1988 which probably indicates continued normal long range mine planning.

The weighted average grade - percent copper - of sulfide ores mined in 1989 was 0.62% copper (Table VI).

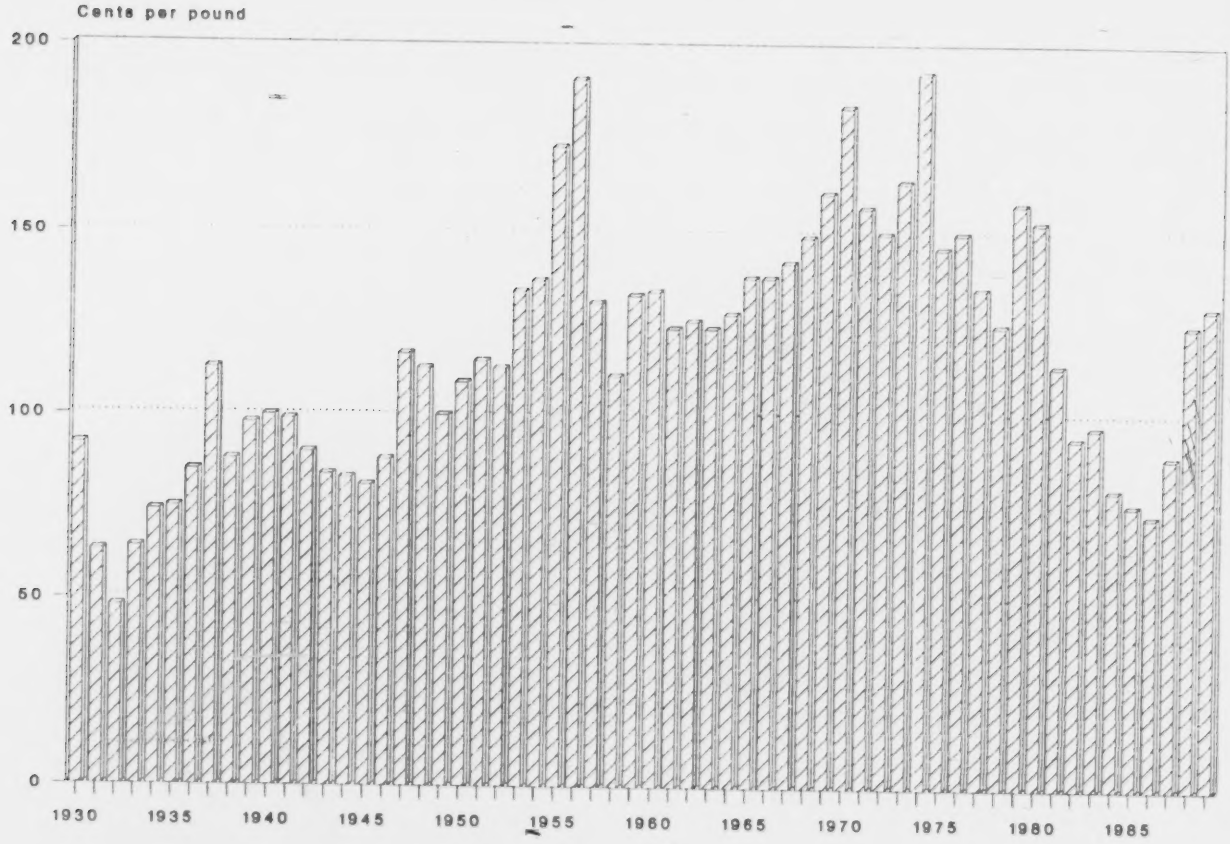
The estimated capacity to produce copper at each of Arizona's principal operations totals 1.131 million tons annually (Table XI). By this estimate the mines, concentrators, and leach facilities operated at 88.8% of capacity in 1989.

The copper reserve base in Arizona by company and property is estimated in Table XIII. The reserve base as defined in "Mineral Facts and Problems" 1985 Edition, Bureau of Mines Bulletin 675, page 3, includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently sub-economic (sub-economic reserves). The many technical, political, social, and economic variables render a listing of actual economic reserves inappropriate.

1989 OPERATIONS SUMMARY

Operating Properties	14
Operating Companies	6
Operating Smelters	3
Ore Mined (including some oxide)	196,684,000 tons
Ore Milled (sulfides)	158,920,000 tons
Waste/Overburden removed (includes some leach material)	261,941,000 tons
Average stripping ratio	1.46:1
Copper produced	1,004,891 tons - 60.8% of U.S.
From sulfide ores	754,556 tons - 75.1% of AZ
Average grade	0.62% copper
From leaching	250,335 tibs - 24.9% of AZ
SX-EW	237,667 tons - 94.9% of leached 23.7% of total
Precipitation	12,668 tons - 5.1% of leached
Molybdenum produced	29,795,000 pounds
Silver produced	4,926,600 troy ounces
Gold produced	69,000 troy ounces
Average employment	11,111
Average annual wage	34,488
Productivity (production workers)	118 lb. of copper per man-hour, 11.6 tons of ore per man-hour

Figure 2. COPPER PRICE IN CONSTANT 1989 DOLLARS



1930's	1940's	1950's	1960's	1970's	1980's
Average: $0.86	Average: $0.91	Average: $1.28	Average: $1.30	Average: $1.49	Average: $0.95
The Great Depression	Wartime Price Controls	Peace and Prosperity	Viet Nam & Social Unrest	Energy Crisis & Stagflation	Recession

Source:
U.S. Gross National Product Deflator Price Index - U.S. Bureau of Economic Analysis
U.S. Producer Price Index of Intermediate Materials for Durable Manufacturing - U.S. Bureau of Labor Statistics
U.S. Consumer Price Index (CPI) - U.S. Bureau of Labor Statistics
Historic Prices - Metals Week: Copper, Wire Bars

As reported in *Non-Ferrous Metal Data, 1983* and *1989*, American Bureau of Metal Statistics

STATUS AND PROGRESS

The recovery of the copper market that began in 1987 continued through 1989. This fact coupled with the improvements in operating efficiencies and the application of improved technology, which were initiated to survive the disastrous market conditions of the mid-eighties, made 1989 a profitable year for Arizona's copper industry.

In spite of the political and labor difficulties that plagued some of the major foreign producers, world mine production increased during the year. However, this increase in production was mostly offset by an increase in consumption. World stocks of refined copper were up by 63,000 short tons (16%) but were still only about of those reported in the mid-eighties. U.S. stocks were down slightly from 1988.

The utilization of capital to increase production and decrease costs at existing operations, as opposed to the development of new ore bodies, remained
the dominant investment philosophy in 1989. Asarco continued the modernization and expansion of production at its Mission and Ray units. Cyprus increased production at Sierrita by adding higher grade ore from Twin Buttes to the concentrator feed. Magma increased recovery at Pinto Valley by the addition of flotation cells in the concentrator. At Miami the leaching of the old Miami Copper Company tailings got underway. Phelps Dodge christened the In Pit Crushing and Conveying (IPCC) system and doubled its SX-EW capacity at Morenci.

At the smaller properties Kocide ceased operations at the Van Dyke. (In July, 1990 it was announced that Arimetco had inquired the Van Dyke from Kocide). Arimetco produced copper precipitate at Emerald Isle and started construction of an SX-EW plant at the Johnson Camp property which is scheduled for production in 1990.

OPEN PIT MINING

The majority of the copper is produced by open pit mining methods. So far most of the improved efficiency has been the result of consolidation, preplanned maintenance, scheduling and utilization of equipment. The computer dispatching at Morenci is but one example of this. Now, however, major changes in operating methods are being instituted.

At Morenci, Phelps Dodge has gone from an all rail haulage system, through an interim system using trucks to service the shovels and haul to in- pit transfer points for rail haulage to the concentrators, to the In Pit Crushing and Conveying system (IPCC).

Cyprus has acquired the Twin Buttes property to provide additional feed to the Sierrita mill as well as oxide ore for the Twin Buttes Oxide plant.

Magma's Pinto Valley division has started slurrying the old No. 2 tailings at Miami, leaching them and redepositing them in the mined out Cities Service Pit.

UNDERGROUND MINING

San Manuel was the only operating underground mine in Arizona during 1989. Development of the Kalamazoo ore body at San Manuel was resumed during the year. Also the Magma Mine at Superior has been dewatered and rehabilitated for production to begin in mid 1990.

Development of Asarco's underground orebody at Sacaton and Phelps Dodge's Safford property has been suspended indefinitely.

IN-SITU MINING

In-situ leaching of rubbleized copper bearing material remaining in mined out underground stopes has long been practiced in Arizona. At San Manuel, Magma is developing a more formalized program of leaching mined out block caving stopes and is approaching production status. During the last few years all of the production from the Lakeshore property has been from a similar system developed by Noranda. Cyprus is continuing this project as well as tests of in-situ leaching of non-rubbleized or virgin ground.

The U.S. Bureau of Mines is funding tests of in-situ leaching of virgin ground in Arizona. Science Applications International Corporation has been awarded a contract to identify analytical procedures and develop computer algorithms that could be used to select the best in-situ mining method for any specific copper oxide deposit. Asarco is cooperating with the Bureau at the Santa Cruz property near Casa Grande. The Santa Cruz ore body is a deep seated acid soluble deposit which is owned by Asarco and Freeport McMoran on a 50-50 basis.

SOLVENT EXTRACTION

Traditionally the copper produced from leach solutions has been extracted by cementation process (precipitation from solution by the replacement of copper in solution by metallic iron). This has been a source of relatively cheap copper, but the cement copper produced must be smelted and refined along with the flotation concentrates.

During the 1960's, Ranchers Exploration and Development Corporation pioneered the use of solvent extraction-electrowinning to produce copper from its Bluebird property near Miami. The obvious advantage of this method is that cathode copper of salable quality can be produced directly from leach solutions. Smelting, with its pollution problems, and further refining are therefore not required.

During the relatively good years experienced by the industry after Rancher's introduction of solvent extraction-electrowinning, interest in the process grew gradually. The disastrous 80's prompted an accelerated interest in it, however. Twelve plants operated during 1989. Several expansions or new plants are planned and the cementation process is being phased out except as a subsidiary method.

CONCENTRATION

The overwhelming majority of copper mineralization in Arizona is of the sulfide type and is not amenable to leaching without extraordinary means. Inspiration has had success with its heap leach-ferric cure process on mixed oxide-sulfide ores and Kennecott pioneered the use of bacteria to convert sulfides to oxides in low grade dumps. However, as shown in Table I, about 75% of the copper was produced by the flotation method of concentration. In addition much of the leached copper produced is from dumps of "waste" that was stripped from open pit mines to provide access to sulfide ore. Another aspect of the flotation process that makes it viable at some properties is the recovery of molybdenum by selective flotation. Molybdenum provides a significant portion of the revenues from some properties. Also, any precious metals in the ore follow the copper through the flotation process and smelting to

the electrolytic refinery where they can be recovered from the anode slimes.

There are currently eight flotation concentrators in operation in Arizona. Asarco is operating 2 - Ray and Mission, Cyprus is operating 2 - Bagdad and Sierrita, Magma is operating 2 - San Manuel and Pinto Valley, and Phelps Dodge is operating 2 at Morenci-Metcalf. Six are on standby; Magma's at Superior, Asarco's at Silver Bell, Cyprus' at Mineral Park, Esperanza, and Miami, and Phelps Dodge's at Ajo.

Although efficiency is constantly being improved, the flotation process is not cheap. It requires crushing and grinding the ore, separation of the ore minerals from the gangue minerals in the flotation cells, smelting the concentrate, and refining the copper anodes from the smelter. The most significant development in flotation is the column flotation cell being installed in most concentrators.

SMELTING

Of the six smelters remaining in Arizona in 1989 only three operated. Asarco's Hayden smelter and Cyprus' smelter at Miami have been brought into compliance with air pollution constraints and Magma's smelter at San Manuel has been retrofitted with an Outo-Kumpu flash furnace to bring it into compliance. The Ray smelter at Hayden that Asarco acquired from Kennecott met all significant environmental constraints when last operated in 1982 and is available if needed. Phelps Dodge's smelters at Ajo and Morenci will require extensive retrofitting before they can be operated. Phelps Dodge is shipping concentrates to its Hidalgo smelter at Playas, New Mexico and to the Chino smelter at Hurley, New Mexico that was recently acquired from Kennecott. Excess concentrates are being sold.

As an alternative to smelting, Cyprus Casa Grande has reactivated the Roast-Leach-Electrowinning (RLE) plant built by Hecla at the Lakeshore property In this process flotation concentrates are roasted to make them acid soluble and leached with sulfuric acid. Salable cathode copper is extracted from the leach solution by electrowinning. Cyprus is upgrading the leach solutions in the solvent extraction plant before electrowinning. Acid is produced from the roaster gases and the process is essentially pollution free.

A portion of the concentrates from Sierrita are being processed at this plant.

PROGNOSTICATION

With the continuation of the political and labor difficulties being experienced by foreign producers, 1989 was expected to be a good year for the copper industry. Its strength, however pleasantly-surprised even the most optimistic expectations.

The outlook for 1990 is also good since these problems in South America, Africa, and the Philippines do not appear to be near resolution. However, the longer view is less optimistic. The new or increased production planned for the first half of the nineties in Portugal, Indonesia, and especially in Chile with Escondida, Disputada, Candalaria and Que Brada Blanca, will have a significant impact on the market. Should Peru, Zaire, Zambia, the Philippines and Papua New Guinea all resolve their political and labor problems during this period the impact on the market could very well be disastrous. This appears to be an extremely remote possibility, although one or two of them could make the grade.

To further confuse the issue the iron curtain nations are now trying to enter the real world. Although they are in possession of large reserves, their productive capacity has been throttled by their bureaucracy. If freed from governmental control the properties in these countries could be major producers of copper before the turn of the century. However, this production, and more could easily be absorbed by increased consumption within these countries. If they are freed to the extend that they can bring their entire economies up to be on a par with the west, consumption will increase dramatically. As with any abrupt change in the living conditions of a significant percentage of the world's population, there are likely to be short term disruptions in the copper market. Severe swings both up and down can occur but in the long run these changes in the worlds economics should prove to be beneficial.

Like all would be prognosticators, I have hedged predictions with numerous ifs and buts. Conditions will either get better, get worse, or stay the same. To be a bit bolder I'll say that, barring the event of a drastic recession, the short term outlook is positive, The decade of the nineties, however, is fraught with too many variables to be comprehensible to my biological computer. I certainly do not, however, expect a return to the "mining is dead" scenario that was foisted upon the industry by its detractors in the eighties.

ARIMETCO INCORPORATED

Corporate Headquarters - 8835 East Speedway Blvd. Suite A, Tucson, Arizona 85710
Phone (602) 290-9200

Arimetco acquired the Emerald Isle and Johnson properties in Arizona and the Yerington property in Nevada during 1989. The Yerington property has been put into production.

In June 1990, Arimetco acquired the Van Dyke property at Miami, Arizona.

Emerald Isle

Kingman, AZ
Phone (602) 565-4554

The Emerald Isle operation consists of in-situ leaching and a precipitation plant in production during 1989. Arimetco plan to install a SX-EW plant with a design capacity of 2 million pounds per year.

Johnson

Benson, AZ
Phone (602) 586-2241

In 1989, Arimetco acquired the Johnson property and started preparing it for production. Construction of a 35,000 pound per day SX-EW plant was started. The material on the previously leached dumps will be crushed, restacked and leached prior to the mining of new ore. Designed production capacity will be 9.5 million pounds of copper per year and is scheduled to start in 1990.

ASARCO INCORPORATED

Corporate Headquarters - 180 Maiden Lane, New York, New York 10038 - Phone (212) 669-1000

In Arizona, Asarco operates copper mines at Sahuarita, Ray and Silver Bell and a copper smelter at Hayden. In Texas, they operate a copper smelter at El Paso and a copper refinery at Amarillo. They also hold major interests in MIM Holdings Limited, Mexico Desarrollo Industrial Minero, S.A. (MEDIMSA) and Southern Peru Copper Corp. (SPCC).

In June 1989 Asarco purchased 49.9% of a partnership formed by Montana Resources to own and operate the Continental Mine in Butte, Montana.

In addition to copper, Asarco mines and refines lead, zinc, gold and silver and produces coal, industrial minerals and chemical and manufactured products.

During 1989 Asarco continued its restructuring and modernization program including the 46% expansion at Mission that was completed in February. A three year, $260 million project to increase production by 40% is planned for Mission, Ray and El Paso. Scheduled for completion in 1992, this expansion will make Asarco independent of outside sources of feed for its smelters.

As a part of this project, $30 million will be spent to retrofit the reverberatory furnaces at El Paso with Con Top smelting units manufactured by KHD of West Germany.

Tucson Office - 1150 N. 7th Ave., P.O. Box 5747, Tucson, Arizona 85703 - Phone (602) 792-3010

The Tucson office houses the Southwest Mining Department, the Mining Department/Corporate Office, the Mineral Beneficiation Department, the Exploration Department, the Acid Sales Department and the Department of Safety and Technical Employment.

During 1989 Asarco's Arizona operation consisted of a major copper smelter at the Hayden Unit, major open pit mines at the Mission and Ray Units, and a dump leaching/cementation operation at the Silver Bell Unit. With the increased production at the Mission Complex, Asarco is able to produce 67% of the feed to its smelters.

Asarco and Freeport McMoran formed the Santa Cruz Joint Venture managed by Asarco. It is participating with the U.S. Bureau of Mines in an in-situ leaching experiment at the Santa Cruz deposit seven miles west of Casa Grande. This large deep seated deposit will be used to determine the feasibility of in-situ leaching of undisturbed virgin ground and to develop a data base for application to other suitable deposits. Hydrologic studies will be followed by the design and development of the leach field and the design of the pilot solvent extraction-electrowinning (SX-EW) plant. In December, 1988 the Joint Venture bought the adjacent Casa Grande deposit that added 300 million tons of reserves. Asarco also holds major reserves at the Chilito north of Hayden, at Helvetia, east of the Mission Complex and at Sacaton East.

Hayden Unit

Box 98, Hayden, Arizona 85235 - Phone (602) 356-7804

The Hayden Unit consists of an INCO flash furnace smelter rated at 940,000 tons of charge per year for an estimated production of 175,000 tons of blister copper. An acid plant rated at 2,800 tons of sulfuric acid per day keeps sulfur dioxide emissions within air quality restraints.

By 1992, when Asarco's expanded and modernized copper facilities are operating at capacity their output will be enough to provide all the feed to its smelter.

Mission Unit

Box 111, Sahuarita, Arizona 85629 - Phone (602) 791-2920

The Mission Unit consists of the consolidation of the Mission, Eisenhower, San Xavier, and Pima open pit mines into one large open pit referred to as the Mission Complex. Also included is the smaller San Xavier North pit. The acquisition of the rest of the Eisenhower in April and of the Mineral Hill deposit adjacent to the Pima section of the open pit late in 1987 increased reserves and facilitates further efficiencies in pit design and mine planning.

Mining is conducted by electric shovels with truck haulage to the primary crusher and waste dumps. Some areas of the pit are back to final limits allowing some waste dumping in pit. The stripping ratio in 1989 was 1.41:1, waste to ore.

The concentrator capacity was increased from 29,000 tons per day to 41,000 tons per day during 1988. This was accomplished by lengthening the 10.5 foot diameter ball mills from 15 feet to 18 feet, installing 2 new ball mills salvaged from the Sacaton mill, converting some of the cleaner flotation cells to roughers and installing six 8x52 foot column flotation cells for cleaners.

Asarco exercised its option to purchase the Pima Mill at the Mission Complex which will

add 19,000 tons per day milling capacity. Of the $260 million capital spending program, $100 million is earmarked to refurbish this mill and expand mining capacity to feed it by mid-1990.

Ray Unit

P.O. Box 9, Hayden, Arizona 85235 - Phone (602) 356-7811

The Ray Unit consists of an open pit mine, dump leach and heap leach operations, and a 40,000 ton per year SX-EW plant at Ray and a 26,000 ton per day concentrator at Hayden. The 400,000 ton per year smelter and 900 ton per day acid plant at Hayden are on stand-by status.

Mining is conducted by electric shovels supplemented by front-end loaders utilizing truck haulage. The production rate is 100,000 tons per day of which 26,000 tons are sulfide ore sent to the mill, and 10,000 tons are silicate ore that is crushed and sent to the leach heaps. The remainder is low grade sent to leach dumps or waste sent to waste dumps. The stripping ratio in 1989 was 1.70:1, waste to ore. The mine plans are predicated on the sulfide operation and therefore silicate ore is stockpiled when in excess and fed from the stockpile to the crushers when short.

Sulfide ore is hauled by truck to the primary crusher at Ray where it is crushed and transferred to trains for the 20 mile haul to the mill.

Silicate ore is hauled to the primary crusher then further reduced to minus 3/4 inch by secondary and tertiary crushers. It is then transported by conveyor where it is agglomerated with sulfuric acid while in transit to the heap leach area. Final haulage and placement on the heaps is by end-dump trucks.

Low grade muck is hauled to prepared leaching areas and non-mineral muck is hauled to waste dumps by end dump trucks. All leach solution are now fed to the SX-EW plant.

Previously stockpiled native copper ore is being reclaimed and fed to the mill in small proportions as is smelter slag.

A $12 million project was started in 1988 to maintain production capacity as the hardness of the ore increases as the pit deepens. In addition, $130 million of the $260 million expansion project will be spent at the Ray Unit. A 60,000 ton per day portable in-pit crusher and conveying system will replace the 30,000 ton per day primary crusher at the pit and a 20,000 ton per day concentrator will be built at the mine site. Concentrates will be hauled by rail to the smelter at Hayden. The project is scheduled for completion in 1992.

Silver Bell Unit

Marana, Arizona 85653 - Phone (602) 622-6551

The Silver Bell Unit consists of an open pit copper mine and an 11,000 ton per day concentrator that are both on stand by status. The dump leaching operation and precipitation plant are in operation. Reactivation of the mine and mill is under consideration.

CYPRUS MINERALS COMPANY

Corporate Headquarters - 9100 E. Mineral Circle, P.O. Box 3299, Englewood, Colorado 80112 - Phone (303) 643-5000

Cyprus has continued to grow. In March 1988 it entered into a 15 year lease of the Twin Buttes property formerly operated by Anamax and in July 1988 they acquired the entire Inspiration property at Miami including the mines, con-

acid plant, electrolytic refinery, and rod plant. Cyprus was the second largest producer of copper in 1989 and continued to be the largest producer of molybdenum.

In addition to its copper-molybdenum properties, Cyprus operates Arizona's largest gold mine, the Copperstone north of Quartzsite, and has entered into a joint venture agreement with Magma to explore the old Mammoth mine, which is a part of Magma's San Manuel property, as a possible gold operation. Cyprus would be the operating partner.

Cyprus has grown on a worldwide basis as well as in Arizona. It operates the Thompson Creek molybdenum mine in Idaho and in July, 1988 it acquired the molybdenum mine at Tonopah, Nevada.

In March 1989, Cyprus acquired the Warrenton Refining Co. in Truesdale, Missouri, a producer of copper ingot and wire bar from scrap. In February of 1990 the acquired MCR Products Inc. in Chicago, Illinois from Magma, a producer of high quality copper rod.

In Australia Cyprus owns a share of and operates the Gidgee, Selwyn and Moline gold mines and has a share of the Sheahan-Grants gold mine. In New Zealand it is developing the Golden Cross Project.

In 1989 Cyprus produced coal from 9 mines in Colorado, Kentucky, Pennsylvania, Utah, West Virginia and Wyoming; talc in Montana, Vermont, Alabama, and Spain; and barite in Georgia. With the acquisition of Foote Mineral Company in April of 1988 it became the major producer of lithium from salt brines in the Silver Peak facility in Nevada and in northern Chile.

Cyprus acquired the Reserve Iron Operation in northern Michigan in 1989. These facilities are being rehabilitated and are expected to be in production in 1990.

Cyprus Bagdad

P.O. Box 245, Bagdad, Arizona 86321 - Phone (602) 633-2241

The Bagdad operation consists of an open pit copper-molybdenum mine, a 55,000 ton per day concentrator, a dump leach operation and an SX-EW plant. A $21 million expansion program currently underway will add a fifth grinding line to the existing mill and increase production capacity 15 to 20 % by mid 1990.

Mining is conducted by electric shovels using truck haulage to the primary crusher and dumps. The stripping ratio in 1989 was 1.23 to 1, waste to ore.

The sulfide ore is transported from the primary crusher at the mine, a distance of 6,400 feet to the coarse ore stockpile at the concentrator, by conveyor belts. There it is crushed further, ground by autogenous and ball mills and copper and molybdenum concentrates are produced. Column cells are utilized in the molybdenum flotation circuit.

Dual process ore (sulfide ore with an unusually high oxide content) is placed in heaps and leached for 60 days before being sent to the concentrator.

Pregnant solutions from the leach dumps are collected behind dams and pumped to the SX-EW plant at approximately 1.8 grams of copper per liter. The barren solutions are returned to the dumps after the copper has been extracted.

Cyprus Casa Grande

P.O. Box C-9, Casa Grande, Arizona 85222 - Phone (602) 623-1539

The Casa Grande operation consists of an in-situ leaching operation and an SX-EW plant. The block caved stopes in the oxide orebody are being leached and development of a leaching operation in virgin ground is underway using high pressure pumps to inject sulfuric acid solution into holes drilled from the old underground workings. Pregnant solutions are collected in sumps underground and pumped to the SX-EW plant.

The roasters and acid plant of the Roast-Leach-Electrowinning (RLE) plant built by Hecla have been refurbished and are treating concentrates from Sierrita. The pregnant solutions go to the SX-EW plant and the acid produced from the roaster gases is used for the leaching operations.

Cyprus Miami

P.O. Box 1559, Claypool, Arizona 85532 - Phone (602) 473-7150

The Cyprus Miami properties consist of three open pit copper mines formerly called Inspiration Mines, a 24,000 ton per day concentrator that is currently on standby status, a 450,000 ton per year electric furnace smelter, acid plant, SX-EW plant, electrolytic refinery and a 135,000 ton per year rod plant.

The ore is mined at the rate of 50,000 tons per day with electric shovels and hauled by truck to high grade, low grade and waste dumps. The stripping ratio in 1989 was 0.96:1 waste to ore. Soon after Cyprus acquired the property the construction of the second, nearly identical, solvent extraction train was completed that increased the capacity of the plant to 8,000 gallons per minute. The 25 cycle AC to DC motor-generators were replaced with modern rectifiers to increase the capacity and efficiency of the tank house. The cathodes from both the electrowinning and electrorefining sections are fed to the continuous cast rod plant to produce 5/16 inch copper rod on reels holding three and one-third miles of rod each.

Cyprus Mineral Park

P.O. Box 6249, Kingman, Arizona 86401 - Phone (602) 565-2226

The Mineral Park property consists of an open pit copper-molybdenum mine and a 15,000 ton per day concentrator that are both on stand by status. The dump leaching operation and the precipitation plant are in operation and some in-pit leaching is also being conducted.

Cyprus Sierrita/Twin Buttes

P.O. Box 527, Green Valley, Arizona 85622 - Phone (602) 791-2950 & (602) 625-4800

The Cyprus Sierrita property consists of an open pit copper-molybdenum mine, a 100,000 ton per day concentrator, a ferromolybdenum plant, a rhenium plant, a dump leaching operation, and an SX-EW plant. The Esperanza pit and 17,500 ton per day concentrator were inactive during 1988 with the exception of the crushers that were used to supplement the Sierrita mill crushers.

Mining is conducted using electric shovels and truck haulage to the crushers and dumps. The stripping ratio in 1989 was 0.77:1, waste to ore. Dump leaching and precipitation began in the early 1960's.

When production ceased at Johnson Camp the SX-EW plant was moved to Sierrita to replace the precipitation plant. Lead anodes, titanium cathodes, extractants and other equipment and reagents were brought from Battle Mountain and Anamax to complete the installation and startup.

Production was started at the Twin Buttes mine in 1988 providing additional feed to the Sierrita Mill. The stripping ratio in 1989 was 8.37:1. Construction of a 6.8 mile conveyor to transport sulfide ore to the Sierita concentrator was completed in 1989. Twin Buttes contributed about one third of the copper produced at the Sierrita concentrator in 1989. The SX-EW plant at Twin Buttes is fed with solutions from leaching tailings.

KOCIDE CHEMICAL CORPORATION

Corporate Headquarters - 1508 N. VIP Blvd. Casa Grande, AZ 85222 - Phone (602) 836-0607

Kocide, a subsidiary of the Griffin Corporation of Valdosta, Georgia, operates a plant in Casa Grande that manufactures agricultural products. The cement copper from the Van Dyke was used to produce copper sulfate used in the manufacture of these products.

Van Dyke Mine

P.O. Drawer D., Miami, AZ 85502 - Phone (602) 473-2421

Production from the Van Dyke in-situ leaching project started in December, 1988. Initially Kocide injected sulfuric acid solution into the old underground stopes and recovered pregnant solution from a production well. Cement copper was precipitated in Kennecott cones using shredded, detinned cans as the precipitant. The planned rate of production was 4,000,000 pounds per year.

The Van Dyke was acquired by Arimetco in June, 1990.

MAGMA COPPER COMPANY

Corporate Headquarters - P.O. Box M, San Manuel, Arizona 85631 - Phone (602)385-3100

In March 1987, after nearly 20 years as a wholly owned subsidiary of Newmont Mining Corporation, Magma once again became an independent corporation. As such it has continued implementing an extensive expansion and modernization program to meet all environmental constraints and to become competitive in the copper market. As part of this program the company housing in the town of San Manuel is being sold.

Magma's Arizona operations are divided into the San Manuel Division and the Pinto Valley Division which include the Pinto Valley Unit and the Miami Units. The original Magma Mine at Superior was closed in 1982 and remained inactive throughout 1988. However, dewatering and rehabilitation was commenced in 1989 and production is scheduled for mid 1990.

Magma also operates a 29 mile railroad from San Manuel and a 28 mile railroad from Superior. Both connect to the Santa Fe Southern Pacific system.

A wholly owned subsidiary, MCR Products, consisting of a rod plant rated at 140,000 tons per year, in Chicago, Ill. was sold to Cyprus in February, 1990.

San Manuel Division

P.O. Box M, San Manuel, Arizona 85631 - Phone (602) 385-3100

The San Manuel Division consists of a block-caving underground copper- molybdenum mine, a 62,000 ton per day concentrator, an open pit oxide copper mine, pad leach, in-situ leach, SX-EW plant, an 800,000 ton per year smelter with a 2000 ton per day acid plant and a 300,000 ton per year electrolytic refinery and a 180,000 ton per year rod plant.

After development of the grizzly and haulage levels, caving is initiated by undercutting the ore block. The caved ore is drawn through the grizzlies to the haulage level. Haulage to the production shafts is by 23 ton trolley locomotives pulling ten 15-17 ton ASEA cars or fifteen 12-13 ton rotary dump cars. After hoisting to the surface the ore is hauled by rail to the mill in 100 ton cars in groups of 35 to 40 pulled by 125 ton diesel-electric locomotives. Development of the Kalamazoo ore body was resumed and limited production is expected in late 1990.

The 62,000 ton per day concentrator was modernized by installing larger but fewer cyclones, by replacing controls with programmable controllers, by replacing small flotation cells with nine 2000 cubic foot Maxwell cells and seventy-two 300 cubic foot machines in the rougher circuit and by replacing conventional cells with column cells in the cleaner circuit.

At the smelter the reverberatory furnaces were replaced with an Outokumpu Flash Smelting Furnace. At a design capacity of 3000 tons of concentrate per day, it is the largest single furnace smelter in the industry. An oxygen plant and modifications to the acid plant were a part of the modernization.

Mining at the open pit oxide mine is accomplished with hydraulic excavators and front end loaders with truck haulage at the rate of 19,000 tons of ore and 33,000 tons of waste per day. Ore is placed on the polyethylene lined leach pads and some of the waste is dumped in the subsidence area. Any sulfide ore that is encountered is hauled to a railroad siding and added to the feed going to the concentrator. Copper is recovered from the leach solutions at the SX-EW plant that uses the ISA process of plating the copper on stainless steel sheets rather than on copper starter sheets. The solutions from the in-situ leaching are also fed to this plant that was expanded to a capacity of 50,000 tons of copper per year.

Cathodes from the electrolytic refinery and the SX-EW plant are melted and cast into continuous rods at the rod plant.

Pinto Valley Division

P.O. Box 100, Miami, Arizona 85631 - Phone (602) 425-7611

The Pinto Valley Division consists of the Pinto Valley Unit and the Miami Unit. At the Pinto Valley Unit mining is accomplished with electric shovels and truck haulage to the 63,000 ton per day concentrator. The addition of 14 1000 cubic foot rougher cells in the concentrator in 1989 is expected to increase the recovery rate by two percentage points. A dump leaching and a 6000 gpm SX-EW plant are also in operation. The concentrates and cathodes are shipped to San Manuel.

At Miami solutions from the in-situ leaching of the old Miami Copper block cave area are treated by SX-EW. Construction of the project to slurry and leach the Miami Copper Company tailings from #2 tailing dam was completed in 1989. This is a process to slurry the tailings by hydraulic mining, leach with sulfuric acid, thicken, extract the copper at the SX-EW plant, and pump the tailings to the mined out Cities Service pit at Sleeping Beauty. To accommodate the additional solution the solvent extraction plant at Miami was modified and the electrowinning tank house was expanded to a capacity of 6,000 gallons per minute of pregnant solution. The tailing thickeners at the old mill were rebuilt to separate the pregnant solution from the solids after leaching.

PHELPS DODGE CORPORATION

Corporate Headquarters - 2600 North Central Avenue, Phoenix, Arizona 85004-3015 - Phone (602) 234-8100

Phelps Dodge Mining Company was formed in September, 1988 as one of two operating divisions of Phelps Dodge Corporation. It is the nation's largest copper producer and accounts for about one-third of the nation's copper production at its mines in southeastern Arizona and southwestern New Mexico. In conjunction with its Arizona operations, Phelps Dodge operates the Hidalgo Smelter near Playas, New Mexico, a 420,000 ton per year refinery at El Paso Texas, a mine at Tyrone and the Chino Mine near Silver City, New Mexico in which it acquired a two-thirds interest from Kennecott at the end of 1986.

The Chino Mines Branch consists of an open pit copper mine, a 45,000 ton per day concentrator, a dump leach precipitation plant, a 500,000 ton per year INCO Flash smelter with an acid plant, and a 45,000 ton per year solvent extraction-electrowinning plant. The mine and concentrator are located at Santa Rita about 15 miles east of Silver City. The smelter is located about 9 miles south of the mine at Hurley.

The Hidalgo smelter near Playas, New Mexico is an OutoKumpo flash furnace rated at 500,000 tons per year. During 1986 the oxygen enrichment plant from the Morenci smelter was installed to increase capacity and efficiency. The resulting increase in sulfur dioxide concentration of the gases improved the operation of the acid plant as well.

The development of an underground mine at the Dos Pobres property near Safford, Arizona was suspended in 1982, allowed to flood in August 1984, and remains inactive. In 1986 Phelps Dodge acquired the nearby Lone Star property from Kennecott.

At Copper Basin near Prescott, Phelps Dodge has continued to pursue a land trade with the Forest Service. This property is being considered as a possible replacement for the Tyrone operation that is scheduled to cease mining operations in the early 1990's.

In addition to its Arizona-New Mexico copper properties Phelps Dodge operates a fluorspar mine in South Africa through its wholly owned subsidiary Phelps Dodge Mining (Pty) Limited and two copper-gold mines in Chile through its wholly owned subsidiary Compania Minerao Ojos del Salado SA. It also has interests in Black Mountain Mining Development Company (Pty) Limited, which operates a major lead-silver-zinc-copper mine in South Africa, and Southern Peru Copper Corporation in Peru.

Phelps Dodge Industries, the other operating division of Phelps Dodge Corporation, produces carbon black through its wholly

owned subsidiary Colombian Chemical Company, wheels and rims for heavy trucks through Accuride Corporation acquired in March, 1988, and Magnet Wire, etc. through Phelps Dodge Magnet Wire Company.

Morenci Branch

Morenci, Arizona 85540 - Phone (602) 865-4521

The Morenci Branch consists of the combined Morenci-Metcalf open pit copper mine, the 60,000 ton per day Morenci concentrator with a molybdenum circuit, the 40,000 ton per day Metcalf concentrator, and a dump leach - SX-EW operation. The 650,000 ton per year smelter with a 2400 ton per day acid plant remain inactive and will require extensive modifications to meet air quality restraints if ever reactivated. Sumitomo Mining Arizona, Inc. holds an undivided 15% interest in the Morenci branch excluding the inactive smelter.

Mining is conducted with electric shovels and truck haulage utilizing a computer controlled Modular Mining Truck Dispatching System for maximum efficiency. During 1989 the completion of the in pit crushing and conveying (IPCC) system eliminated rail haulage completely. The trucks are dumped into the two semi-mobile primary crushers in the pit and the crushed ore is conveyed to the coarse ore stockpile by conveyor belt. Each concentrator is fed by conveyors running under the stockpile. Both concentrators are standard flotation mills except that column flotation cells have been installed in the cleaner circuit of each. Total production of these two concentrators was 235,700 tons in 1989.

All mined material other than ore is classified as leach material and is taken to one of several leach dumps. There are three widely spaced solvent extraction plants to upgrade the solutions before they are pumped to the centrally located tank house for electrowinning. During 1989. the capacity of the SX-EW system was doubled from 50,000 to 100,000 tons of cathode copper per year. As part of the Northwest Extension project the SX-EW capacity will be increased to 170,000 tons per year. This project will initially provide acid soluble material for leaching and will develop sulfide feed for the concentrates.

Copper Queen Branch

Highway 92, Bisbee, Arizona 85603 - Phone (602) 432-3621

The Copper Queen facility consists of a dump leaching and precipitation operation at the mined out Lavender pit.

A drilling program on an area north of the Lavender pit was conducted in 1987 to define a possible ore body amenable to treatment by heap leaching and SX-EW. The results of a feasibility study are not yet available.

New Cornelia Branch

Ajo, Arizona 85321 - Phone (602) 387-7451

The New Cornelia Branch consists of an open pit copper mine, a 30,000 ton per day concentrator with a molybdenum circuit and a 190,000 ton per year smelter with an acid plant. The mine has been inactive since August 1984 and the smelter was shut down in April 1985. There are no immediate plans to reactivate the operation but it is being considered as a replacement for the Tyrone operation if economic conditions are suitable in the early 1990's.

SEVERANCE TAX ON METALLIFEROUS MINERALS

Background

Laws of 1982, Chapter 230, repealed the tax on sales of metalliferous minerals and enacted a severance tax in its place. Under the provisions of the severance tax, metalliferous minerals were to be taxed at the time of production, not at the time of sale. All metalliferous minerals produced after 1982 were to be taxed on the greater of the following 2 values:

1. The "weighted mineral value" which is essentially the cost of extracting the minerals from the earth and delivering them to the site where they will be processed, or

2. A specified percentage of the old sales tax base.

The severance tax was to be levied on metalliferous minerals at a rate of 2 1/2 percent. Unless otherwise provided by law, the tax was to be administered in the same manner as the sales tax. As a result, severance tax payments were due on the first day of the second month following the month in which the tax accrued. From January 1, 1983 through June 30, 1983, 40 percent of the severance tax was to be distributed in the same manner as the transaction privilege tax (i.e. 25 percent to the cities, 33.6 percent to the counties and 41.4 percent to the state). In subsequent fiscal years, a progressively larger share of the severance tax was to be distributed in the same manner as the transaction privilege tax. The balance of severance tax collections, after making this distribution, was to be deposited each year in the state's general fund. (Effective from and after December 31, 1982.)

Laws of 1983, Chapter 4 changed the due date for payment of the Severance Tax to the twentieth day of the month following the month in which the tax accrues. Taxes were to be delinquent if not received by the Department of Revenue on the day preceding the last day of the month in which they were due. (Effective April 1, 1983). The law also changed the interest rate on delinquent tax payments to equal the rate established by Section 6621 of the Internal Revenue Code, compounded annually. (Effective February 11, 1983.)

Legal Citation

A.R.S. 42-1461 - 42-1466.

Paid by

Persons engaged in the business of extracting substances from the earth that become metalliferous minerals (A.R.S. 42-1461 - 42-1462.)

Exemptions

None.

Tax Base

The severance tax is levied on the "net severance base" of all metalliferous minerals produced after 1982 (42-1462). The "net severance base" is the greater of the following 2 values (42-1464, Laws of 1982, Chapter 230, Section 12):

1. The "weighted mineral value", or

2. A specified percentage of the old sales tax base (the gross value of production less out-of-state processing costs). This value will be referred to as the "Arizona value" after June 30, 1985.

The "weighted mineral value" is essentially the cost of extracting the minerals from the

earth and delivering them to the site where they will be processed.

The "weighted mineral value" is determined using the following formula (42- 1464):

$$\text{weighted mineral value} = \frac{\text{mining costs}}{\text{total production costs}} \times \text{gross value of production}$$

where:

- mining costs represent the cost of extracting the minerals from the earth and delivering them to the site where they will be processed further (42-1461).

- total production costs include most of the major costs incurred in mining and processing minerals until the point of sale (42-1461).

- gross value of production is determined by multiplying the recoverable units of a metallic product by the per unit price of the product; the price per unit does not include the cost of manufacturing, fabricating or otherwise transforming a refined mineral product, when these activities occur prior to sale of the product (42-1461).

Although metalliferous minerals will no longer be taxed on the old sales tax base, the value of minerals produced after 1982 may not fall below a specified percentage of the old tax value (42-1464, Laws of 1982, Chapter 230, Section 12). The old tax value included not only the cost of extracting the minerals from the earth, but most of the major in-state costs of producing the minerals. This value was determined by multiplying the recoverable units of a metallic product by the per unit price and deducting the out-of-state processing costs from the result (42-1464; Laws of 1982, Chapter 230, Section 12; 41-1461). The following table shows the minimum percentage of the old tax value that may be assigned to minerals for severance tax purposes (42-1464; Laws of 1982, Chapter 230, Section 12):

Period during which minerals are produced	Minimum value of minerals for purposes of determining the severance tax
Jan. 1, 1983 - June 30, 1983	100% of the old taxable sale value
July 1, 1983 - June 30, 1984	831/3% of the old taxable sale value
July 1, 1984 - June 30, 1985	66 2/3% of the old taxable sale value
July 1, 1985 and thereafter	50% of the old taxable sale value

Tax Rate

During fiscal years 1980-81, 1981-82 and 1982-83, businesses that produced mineral products were permitted to claim a tax credit against the Special Excise Tax for Education. The tax credit was determined by formula (see "TAX CREDIT" under "SPECIAL EXCISE TAX FOR EDUCATION"). The tax credit could not exceed the taxpayer's Special Excise Tax liability for the year. However, if a taxpayer had an unused amount of credit for any year in which his production was curtailed due to economic conditions, the unused credit could be carried forward for a period not to exceed three years. Since the Special Excise Tax does not apply to metalliferous minerals after December 31, 1982, businesses that produce metalliferous minerals are authorized to claim this tax credit against their severance tax liability, beginning in 1983. In 1982-83, the amount of credit claimed may not exceed 40 percent of the taxpayer's severance tax liability

(Laws of 1982, Chapter 228, Section 2; Laws of 1982, Chapter 230, Section 15).

Due Date

Collections from the severance tax on metalliferous minerals are due on the twentieth day of the month following the month in which the tax accrues. Taxes are delinquent if they are not received by the Department of Revenue on the day preceding the last day of the month in which they are due. The due date may be extended by the Department of Revenue for good cause, but not beyond the first day of the third month following the regular due date (42- 1465, 42-1322).

Collecting Agency

Department of Revenue. (42-1462, 42-101)

Dedication or Purpose

To aid in defraying the necessary and ordinary expenses of the state, cities, and counties to reduce or eliminate the annual tax levy on property for state, city and county purposes and to reduce the levy on property for public school education (Laws of 1982, Chapter 230, Section 17).

Yield

No monies will be collected from this tax until fiscal year 1982-83.

Distribution

Each year, a portion of severance tax collections will be distributed in the same manner as the transaction privilege tax (i.e. 25 percent to the cities, 33.6 percent to the counties and 41.4 percent to the state). The portion of collections that is distributed in this manner will increase each fiscal year until 1986-87. The table below shows the amount of severance tax collections that will be distributed in the same manner as transaction privilege taxes during each fiscal year (42-1465, Laws of 1982, Chapter 230, Section 16).

Period during which collections are received	Portion of severance tax collections distributed in the same manner as the transaction privilege tax
January 1, 1983 - June 30, 1983	40%
July 1, 1983 - June 30, 1984	48%
July 1, 1984 - June 30, 1985	60%
July 1, 1985 and thereafter	80%

After making this distribution the balance of severance tax collections will be deposited each year in the state's general fund and is appropriated for public educational purposes (42-1465; Laws of 1982, Chapter 230, Section 16).

Source: State of Arizona Tax Handbook - 1983

Prepared by the Staff of the Joint Legislative Budget Committee

PROPERTY TAX

The following has been excerpted from "**Appraisal Manual for Mines and Natural Resources**" by Donald E. Ross of the Arizona Department of Revenue which was effective as of January 1, 1988 and is revised annually.

The Natural Resource Unit of the Division of Property Valuation and Equalization is assigned the responsibility of valuing producing and nonproducing mines and oil, gas, and geothermal interests. Arizona Department of Revenue mine valuation regulations R15-4-201 through R15-4-206 are incorporated into this manual.

Arizona Revised Statutes (ARS Section 42-201.8) states:

"Producing mine or mining claim" means any mine or mining claim from which any coal, mineral or mineral substance, other than clay, sand, gravel, building stone or any mineral substance normally processed into artificial stone, has been extracted for commercial purposes at any time during a period of one year prior to the first Monday in January of the tax year."

A producing mine includes the land utilized for mining purposes together with structures and facilities necessary to sustain mining operations. It also includes equipment used directly in the process of extracting ores or minerals from the earth for commercial purposes, including equipment required to prepare the materials for extraction and the handling, loading or transportation of such extracted material to the surface. Mining includes underground, surface and open-pit operations for the extraction of ores and minerals.

If mining operations cease, real and personal property associated with a mining operation will continue to be valued by Centrally Valued Properties for a period of three years. The nonoperating mine will be retained in the legal class 1 for the first year after mining operations are terminated. The legal class designation used for the next two years will depend on the use of the property, which could be class 4 if the property remains idle.

Three years after mining operations have ceased, the valuation of the nonproducing mining property will be transferred from the Centrally Valued Properties' jurisdiction to the Locally Valued Properties' jurisdiction. From this point on, the county assessor is responsible for classifying and valuing the subject property. Such property will be classified according to its current use. If the real and/or personal property is idle at the expiration of the three-year period, it normally will be classified legal Class Four property.

The Natural Resource Unit of the Centrally Valued Properties Section of the Arizona Department of Revenue is responsible for determining annually the value of all producing mines as of the first day of January of the tax year. Property within the context of a producing mine excludes manufacturing operations such as a rod plant. In summary, the value of taxable producing mine property for Arizona property tax purposes includes land, supplies inventories, ore reserves, construction work in progress, personal property and improvements.

Summary of Procedures

Producing mines are taxed on the basis of their assessed value multiplied by the local tax rate which produces the tax due. The

assessment ratio for 1988 is 28% of the full cash value or market value. The full cash value is determined by the mineral property appraiser after correlating the three approaches to value, namely the income, cost and market approaches.

The income approach consists of discounting two different future income streams as developed by (1) the mining company and (2) by the Department utilizing a single rate factor. The Department has developed a method in which a five-year history, expressed as a profit margin, is combined with the future production schedule to produce a future income stream. The historical data are expressed on a production basis, not on a sales basis. This five-year margin method avoids the problems of predicting the future price of copper and other metals. It is supported in the literature and has been approved by the Arizona Supreme Court. The past is only a valid indicator of the performance level of a relatively stable operation and should not be used for new or dying mines. The historical data are averaged to flatten the effects of the peaks and it is generally accepted as standard for financial reporting, and the Securities and Exchange Commission reports.

Cost approach values are determined by computing the reproduction cost new less depreciation for the physical assets. Straight line deprecations is utilized along with appreciation or inflation factors as developed by the Department (Table I). Economic and functional obsolescence can be allowed for by the appraiser if warranted.

Comprehensive field notes are written for each mine annually. Contacts with the mining industry are maintained in order to keep abreast of development in technology and discount rates. Technical papers and literature are collected, indexed, and placed in the listing of references for each mine appraisal report. Detailed production statistics are maintained in order to analyze the historical performance for the mine.

TABLE I

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES
1989

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
ARIMETCO					
Emerald Isle					
In Situ/Cementation			48,000		
Total			48,000		
ASARCO, INC.					
Mission Unit					
Sulphide	9,927,000	9,927,000	117,243,000		14,016,000
San Xavier [1]	3,072,000	3,072,000	26,765,000		20,655,000
Ray Unit					
Sulphide	9,524,000	9,524,000	153,879,000		25,412,000
Oxide	5,311,000				
Heap Leach/SX-EW			58,071,000		
Dump Leach/SX-EW			21,862,000		
Silver Bell Unit					
Dump Leach/Cementation			10,017,000		
Total	**27,834,000**	**22,523,000**	**387,837,000**		**60,083,000**

[1] *San Xavier ore concentrated at Mission Complex.*

(continued)

TABLE 1 (CONT'D)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES
1989

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
CYPRUS MINERALS CO.					
Bagdad					
Sulphide	22,844,000	22,381,000	176,372,000	8,697,000	28,095,000
Dump Leach/SX-EW			22,262,000		
Casa Grande					
In Situ/SX-EW			5,000,000		
Miami					
Oxide	20,115,000				19,241,000
Heap Leach/SX-EW[1]			124,179,000		
Dump Leach/Cementation			188,000		
Mineral Park					
In Situ/Cementation			1,526,000		
Dump Leach/Cementation			1,812,000		
Sierrita					
Sulphide	32,190,000	32,190,000	151,800,000	14,900,000	25,409,000
Dump Leach/SX-EW[2]			8,400,000		
Twin Buttes					
Sulphide	2,814,000	2,814,000	67,322,000		23,563,000
Oxide			18,800,000		
Agitation Leach/SX-EW	1,216,000				
Total	**79,179,000**	**57,385,000**	**577,661,000**	**23,597,000**	**96,308,000**

1. *Although some of this production is from old dumps, it is undifferentiated and is reported as heap leach.*

2 *Sulphide ore is concentrated at Sierrita Concentrator.*

(continued)

TABLE 1 (CONT'D)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES
1989

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
KOCIDE MINING CORP.					
Van Dyke[1]					
In Situ/Cementation			654,000		
Total			654,000		
1. *Operation permanently suspended in October 1989.*					
MAGMA COPPER CO.					
Pinto Valley Division					
Sulphide	21,229,000	21,610,000	162,550,000	1,268,000	32,480,000
Dump Leach/SX-EW			10,214,000		
Miami					
In Situ			8,882,000		
No. 2 Tailings	1,349,000		1,917,000		
San Manuel Division					
Underground-Sulphide	16,582,000	16,672,000	180,793,000	3,039,000	
Open Pit-Sulphide	71,000	71,000	976,000		23,201,000
-Oxide	9,417,000				
Heap Leach/SX-EW			60,143,000		
In Situ/SX-EW			8,712,000		
Total	**48,648,000**	**38,353,000**	**434,187,000**	**4,307,000**	**55,681,000**

(continued)

TABLE 1 (CONT'D)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES
1989

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
PHELPS DODGE CORP.					
Copper Queen Branch					
Dump Leach/Cementation			4,762,000		
Morenci Branch[1]					
Sulphide	41,023,000	40,659,000	471,412,000	1,891,000	49,869,000
Dump Leach/SX-EW			126,892,000		
Dump Leach/Cementation			6,329,000		
Total	**41,023,000**	**40,659,000**	**609,395,000**	**1,891,000**	**49,869,000**
Totals					
Sulphide	159,276,000	158,920,000	1,509,112,000	29,795,000	219,499,000
Oxide (Leach)	37,408,000				43,442,000
Heap Leach/SX-EW			242,393,000		
Dump Leach/SX-EW			189,630,000		
Dump Leach/Cementation			23,108,000		
In Situ/SX-EW			22,594,000		
In Situ/Cementation			2,228,000		
Agitation Leach/SX-EW			20,717,000		
Sub Total Leached			**500,670,000**		
SX-EW			475,334,000		
Cementation			25,336,000		
GRAND TOTAL	**196,684,000**	**158,920,000**	**2,009,782,000**	**29,795,000**	**261,941,000**

1. *Includes Sumitomo's 15%.*

TABLE II

ARIZONA LEACH COPPER PRODUCTION (1

(Thousand Pounds)

MINE OPERATION	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ARIMETCO										
Emerald Isle	--	--	--	--	--	--	--	--	--	48
Johnson (2	10,302	10,693	9,702	--	8,803	6,200	--	--	--	--
ASARCO INCORPORATED										
Silver Bell	4,423	7,950	8,687	10,374	9,152	8,800	6,814	12,800	8,660	10,017
Ray (3	25,875	25,788	22,420	20,033	20,457	23,706	56,639	68,543	76,966	79,933
CYPRUS MINES CORP.										
Bagdad	12,668	13,244	13,173	13,282	14	14,259	13,958	16,470	19,100	22,262
Bluebird (4	13,017	13,328	NR	--	--	--	--	--	--	--
Casa Grande (5	--	26,071	45,611	3,244	15,401	13,514	7,100	4,145	4,300	5,000
Miami (6	28,958	50,532	50,000	78,988	79,549	85,136	98,747	105,555	115,293	124,367
Mineral Park (7	3,690	4,194	3,191	3,101	2,718	3,798	4,251	4,405	4,500	3,338
Ox Hide (6	1,015	761	1,572	--	--	--	--	--	--	--
Sierrita/Esperanza (7	9,991	11,566	9,354	6,367	8,500	10,000	8,770	7,943	8,556	8,400
Twin Buttes (8	63,719	67,922	60,796	50,649	50,239	19,824	--	--	--	18,800
KOCIDE MINING CORP.										
Van Dyke	--	--	--	--	--	--	--	--	67	654
MAGMA COPPER CO.										
Copper Cities	3,984	3,622	2,046	--	--	--	--	--	--	--
Pinto Valley/Miami	11,184	15,736	26,958	24,632	25,602	23,947	22,252	22,724	23,413	21,013
San Manuel (9	--	--	--	--	--	--	21,923	51,278	62,956	68,855
PHELPS DODGE CORPORATION										
Copper Queen Branch	6,052	4,600	4,545	5,200	3,493	4,144	3,454	2,730	2,700	4,762
Morenci Branch	86,840	96,090	75,735	69,158	60,312	53,228	56,261	45,249	108,426	133,221
New Cornelia Branch	--	--	661	--	920	402	--	--	--	--

continued

TABLE II (CONT'D)

ARIZONA LEACH COPPER PRODUCTION

(Thousand Pounds)

MINE OPERATION	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
RANCHERS										
Old Reliable	1,128	149	--	--	--	--	--	--	--	--
TOTALS	282,846	352,246	334,451	285,028	285,160	266,958	300,169	341,842	434,937	500,670
PERCENT OF PRIMARY COPPER PRODUCED *(10*	16.4	15.0	19.6	18.8	18.0	15.0	17.1	19.8	23.1	24.9

(1 Copper recovered by precipitation or by solvent extraction from material dump, heap, vat or in situ leached.
(2 Arimetco acquired Johnson Camp from Cyprus in August 1989.
(3 Asarco purchased Ray Unit from Kennecott, November 18, 1986.
(4 Operated by Ranchers, became part of Inspiration Area Mines, July, 1984 and Cyprus Miami, July, 1988.
(5 Hecla Lakeshore through 3/31/79; Noranda Lakeshore through 6/31/87; Now Cyprus Casa Grande.
(6 Sold by Inspiration to Cyprus, July 1, 1988.
(7 Cyprus purchased Sierrita/Esperanza and Mineral Park from Duval, April 1, 1986.
(8 Operated by ANAMAX. Acquired by Cyprus, March, 1988.
(9 Open Pit, Heap Leach, SX-EW start-up in spring of 1986. Some In Situ test production.
(10 Leach Copper compared to total copper produced as reported in this report, Table I.

Source: Arizona Department of Mines and Mineral Resources; This report, Table I-II

TABLE III

RANK OF ARIZONA'S COPPER COMPANIES

BY PRODUCTION OF COPPER AND MOLYBDENUM

1989

Copper			Molybdenum		
Rank	Company	% of AZ Production	Rank	Company	% of AZ Production
1	Phelps Dodge Corp. 609,395,000	30.3	1	Cyprus Minerals Co. 23,597,000	79.2
2	Cyprus Minerals Co. 577,661,000	28.8	2	Magma Copper Co. 4,307,000	14.5
3	Magma Copper Co. 434,187,000	21.6	3	Phelps Dodge Corp. 1,891,000	6.3
4	Asarco Inc. 387,837,000	19.3			
5	Kocide Mining Corp. 654,000	0.0			
6	Arimetco 48,000	0.0			
TOTAL	2,009,782,000	100.0		29,795,000	100.0

TABLE IV

RANK OF ARIZONA'S COPPER MINES
BY PRODUCTION OF COPPER AND MOLYBDENUM
1989

	Copper			Molybdenum	
Rank	Mine/Company Copper Produced, lb.	% of AZ Production	Rank	Mine/Company Moly Produced, lb.	% of AZ Production
1	Morenci/Phelps Dodge 604,633,000	30.1	1	Sierrita,Twin Buttes/ Cyprus 14,900,000	50.0
2	San Manuel/Magma 250,624,000	12.5	2	Bagdad/Cyprus 8,697,000	29.2
3	Sierrita,Twin Buttes/ Cyprus 246,322,000	12.3	3	San Manuel/Magma 3,039,000	10.2
4	Ray/Asarco 233,812,000	11.6	4	Morenci/Phelps Dodge 1,891,000	6.3
5	Bagdad/Cyprus 198,634,000	9.9	5	Pinto Valley/Magma 1,268,000	4.3
6	Pinto Valley,Miami/Magma 183,563,000	9.1			
7	Mission/Asarco 144,008,000	7.2			
8	Miami/Cyprus 124,367,000	6.2			
9	Silver Bell/Asarco 10,017,000	0.5			
10	Casa Grande/Cyprus 5,000,000	0.2			
11	Copper Queen/Phelps Dodge 4,762,000	0.2			
12	Mineral Park/Cyprus 3,338,000	0.2			
13	Van Dyke/Kocide 654,000	0.0			
14	Emerald Isle/Arimetco 48,000	0.0			
Total	2,009,782,000	100.00		29,795,000	100.00

TABLE V

ARIZONA MINE PRODUCTION OF RECOVERABLE COPPER IN SHORT TONS

	1985		1986		1987		1988		1989	
	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE
BY MONTH										
JANUARY	72,508	6.5%	78,138	7.8%	71,816	(8.1)%	77,612	8.1%	81,455	5.0%
FEBRUARY	67,823	8.6	67,524	(0.4)	65,448	(3.1)	73,465	12.2	79,227	7.8
MARCH	76,717	16.1	72,834	(5.1)	72,674	(0.2)	82,552	13.6	91,491	10.8
APRIL	75,928	24.3	70,306	(7.4)	67,637	(3.8)	76,379	12.9	79,549	4.2
MAY	76,690	16.0	73,446	(4.2)	69,843	(4.9)	77,872	11.5	82,315	5.7
JUNE	70,816	(0.4)	72,747	2.7	68,985	(5.2)	75,089	8.8	78,643	4.7
JULY	72,534	3.3	74,009	2.0	68,090	(8.0)	77,316	13.5	80,152	3.7
AUGUST	74,134	5.9	71,488	(3.6)	69,596	(2.6)	82,747	18.9	84,995	2.7
SEPTEMBER	70,732	1.7	72,402	2.4	69,498	(4.0)	77,467	11.5	80,169	3.5
OCTOBER	74,081	1.0	76,159	2.8	71,478	(6.1)	79,386	11.1	82,790	4.3
NOVEMBER	73,129	(0.6)	70,220	(3.6)	75,349	7.3	76,173	1.1	77,303	1.5
DECEMBER	78,987	14.6	70,635	(10.6)	76,930	8.9	80,906	5.2	81,502	0.7
				CUMULATIVE YEAR TO DATE						
JANUARY	72,508	6.5%	78,138	7.8%	71,816	(8.1)%	77,612	8.1%	81,455	5.0%
FEBRUARY	140,331	7.5	145,662	3.8	137,264	(5.8)	151,077	10.1	160,682	6.4
MARCH	217,048	10.4	218,496	0.7	209,938	(3.9)	233,629	11.3	252,173	7.9
APRIL	292,976	13.7	288,802	(1.4)	277,575	(3.9)	310,008	11.7	331,722	7.0
MAY	369,666	14.2	362,248	(2.0)	347,418	(4.1)	387,880	11.6	414,037	6.7
JUNE	440,482	11.5	434,995	(1.2)	416,403	(4.3)	462,969	11.2	492,680	6.4
JULY	513,016	10.3	509,004	(0.8)	484,493	(4.8)	540,285	11.5	572,832	6.0
AUGUST	587,150	9.7	580,492	(1.1)	554,089	(4.5)	623,032	13.3	657,827	5.6
SEPTEMBER	657,882	8.8	652,894	(0.8)	623,587	(4.5)	700,499	12.3	737,996	5.4
OCTOBER	731,963	8.0	729,053	(0.4)	695,065	(4.7)	779,885	12.2	820,786	5.2
NOVEMBER	805,092	7.1	799,273	(0.7)	770,414	(3.6)	856,058	11.1	898,089	4.9
DECEMBER	884,079	7.7	869,908	(1.6)	847,344	(2.6)	936,964	11.2	979,591	4.5
AVERAGE MONTH	**73,673**	**7.7%**	**72,492**	**(1.6)%**	**70,612**	**(2.6)%**	**78,080**	**10.6%**	**81,633**	**4.5%**

NOTE: Percentage change column shows change from corresponding period in prior year. Parentheses indicate a negative change.

Source: U.S. Department of the Interior, Bureau of Mines

Prepared By: State of Arizona Joint Legislative Budget Committee

TABLE VI

AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES

(Percent Total Copper)

MINE OPERATION		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ASARCO INCORPORATED											
Mission (1	Sulphide	0.75	0.75	(0.75)	(0.75)	(0.75)	0.65	0.70	0.67	0.73	0.70
Pima (1	Sulphide	0.49	0.49	0.48	--	--	--	--	--	--	--
Ray Unit 2 (3	Sulphide	0.91	0.97	0.80	1.19	1.13	0.99	0.99	0.89	1.00	0.97
	Oxide (Silicate)	--	--	--	--	--	1.17	1.23	1.15	1.11	1.13
San Xavier (1	Sulphide	0.65	0.65	(0.65)	(0.51)	(0.51)	--	--	--	--	0.55
CYPRUS MINES CORPORATION											
Bagdad	Sulphide	0.50	0.50	0.50	0.50	0.45	0.44	0.45	0.48	0.45	0.49
Bluebird (4	Oxide	0.40	0.40	--	--	--	--	--	--	--	--
Christmas (OP) (5	Sulphide	0.73	0.62	--	--	--	--	--	--	--	--
Esperanza (6	Sulphide	0.32	0.29	0.29	--	--	--	--	--	--	--
Johnson	Oxide	0.40	0.40	0.40	0.40	0.71	--	--	--	--	--
Lakeshore	Oxide	--	1.00	1.00	(1.00)	(1.00)	--	--	--	--	--
Miami (5	Sulphide	0.58	0.58	0.58	0.53	0.55	0.60	0.54	--	--	--
	Oxide	--	--	--	--	0.50	0.49	0.57	0.59	0.52	0.49
Mineral Park (6	Sulphide	0.24	0.32	--	--	--	--	--	--	--	--
Sierrita (6	Sulphide	0.34	0.30	0.30	(0.30)	0.34	0.33	0.34	0.33	0.30	0.31
Twin Buttes (7	Sulphide	0.82	0.74	0.78	0.57	--	--	--	--	3.39	1.90
	Oxide	1.26	1.20	1.06	0.93	0.86	0.84	--	--	1.22	1.13
MAGMA COPPER COMPANY											
Pinto Valley	Sulphide	0.49	0.46	0.46	--	0.44	0.45	0.45	0.36	0.37	0.46
San Manuel	Sulphide	0.65	0.64	0.66	0.64	0.64	0.61	0.62	0.62	0.63	0.64
	Oxide	--	--	--	--	--	--	0.58	0.64	0.61	0.56
Superior	Sulphide	4.32	4.48	4.32	--	--	--	--	--	--	--

(continued)

TABLE VI (CONT'D)

AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES

(Percent Total Copper)

MINE OPERATION		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
PHELPS DODGE CORPORATION											
Metcalf	Sulphide	0.69	--	0.78	--	--	--	--	--	--	--
Morenci (8	Sulphide	0.82	0.74	0.72	0.73	0.81	0.86	0.84	0.82	0.88	0.79
New Cornelia	Sulphide	0.51	0.50	0.64	0.60	0.55	--	--	--	--	--
WEIGHTED AVERAGE SULPHIDE GRADE		0.58	0.58	0.59	0.65	0.70	0.62	0.61	0.58	0.60	0.62

( ) Percentage in parenthesis is approximate: Not used in calculation of weighted average.

(1 Combined as Mission Complex in 1985.

(2 Ray Unit acquired from Kennecott, November 18, 1986.

(3 Grade reported for Ray Unit is an average of oxide and sulphide together though 1982.

(4 Bluebird property acquired by Inspiration in 1984 and by Cyprus as part of Cyprus Miami, March 1988.

(5 Acquired from Inspiration, July 1, 1988.

(6 Sierrita, Esperanza and Mineral Park acquired from Duval Corp., April 1, 1986.

(7 Included ANAMAX share of Palo Verde deposit for 1979-1982. Acquired by Cyprus, March 1988.

(8 Combined Metcalf and Morenci mines production in 1983 et seq.

(9 Weighted average grade of ore milled, based generally on an assay of total copper.

Source: Company annual reports, Form 10-K's and Prospectus: Personal correspondence and Arizona Department of Mines and Mineral Resources.

TABLE VII

PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES

(Percent of Total Copper)

MINE OPERATION		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ASARCO INCORPORATED											
Mission *(1*	Sulphide	87	94	85	80	(80 est)	92	91	89	87	84
Pima *(1*	Sulphide	84	76	89	--	--	--	--	--	--	--
Ray *(2*	Sulphide	--	70	70	(70 est)	83	81	82	84	83	81
San Xavier *(1*	Sulphide	66	76	78	79	(80 est)	--	--	--	--	79
CYPRUS MINES CORPORATION											
Bagdad	Sulphide	76	94	83	83	92	91	93	90	91	84
	Oxide	--	--	--	--	52	51	54	42	46	90
Bluebird *(3 (4*	Oxide	41	156	--	--	--	--	--	--	--	--
Christmas (OP) *(6*	Sulphide	70	71	--	--	--	--	--	--	--	--
Esperanza *(5*	Sulphide	90	87	--	--	--	--	--	--	--	--
Johnson	Oxide	86	86	--	62	(62 est)	--	--	--	--	--
Miami *(7*	Sulphide	81	74	68	86	80	76	66	69	N/A	93
Mineral Park *(5*	Sulphide	84	75	--	--	--	--	--	--	--	--
Sierrita *(5*	Sulphide	86	80	98 (?)	(88 est)	89	92	91	89	87	86
Twin Buttes *(8*	Sulphide	87	85	--	--	--	--	--	--	87	83
	Oxide	76	77	87	(80 est)	80	(80 est)	--	--	--	72
MAGMA COPPER COMPANY											
Pinto Valley	Sulphide	83	94	95	--	88	80	84	82	84	82
San Manuel	Sulphide	95	87	89	86	90	90	90	85	86	82
Superior	Sulphide	95	93	(93 est)	--	--	--	--	--	--	--
PHELPS DODGE CORP.											
Metcalf	Sulphide	58	--	--	--	--	--	--	--	--	--
Morenci *(9*	Sulphide	64	69	68	71	70	86	76	74	72	73
New Cornelia	Sulphide	79	78	85	78	76	--	--	--	--	--

continued

TABLE VII (CONT'D)

PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES

(Percent of Total Copper)

(1 *Combined as Mission Complex in 1985.*

(2 *Ray Unit acquired from Kennecott, November 18, 1986.*

(3 *Bluebird property acquired by Inspiration in 1984 and by Cyprus as part of Cyprus Miami, July 1, 1988.*

(4 *Recovery by leaching heaps continued after mining was terminated in July 1981.*

(5 *Sierrita, Esperanza, and Mineral Park acquired from Duval Corp., April 1, 1987.*

(6 *Acquired from Inspiration, July 1, 1988.*

(7 *Percent recovery by leaching since 1986. Acquired from Inspira;tion, July 1, 1988.*

(8 *Recovery includes ANAMAX's share of Palo Verde 1981-1982-1983-1984. Acquired by Cyprus in March, 1989.*

(9 *Includes Metcalf production since 1981.*

TABLE VIII

STRIPPING RATIOS AT ARIZONA OPEN-PIT COPPER MINES (1

(Waste:Ore)

MINE OPERATION	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ASARCO INCORPORATED										
Eisenhower (2 (3	--	0.71:1	0.67:1	0.57:1	1.26:1	--	--	--	--	--
Mission (3	3.05:1	2.01:1	1.62:1	2.52:1	1.32:1	0.74:1	0.84:1	1.05:1	2.02:1	1.41:1
Pima (3	6.28:1	3.06:1	1.42:1	--	--	--	--	--	--	--
Ray (4	3.15:1	1.88:1	2.30:1	2.72:1	2.11:1	2.27:1	2.12:1	1.99:1	2.10:1	1.70:1
Sacaton	2.02:1	1.30:1	0.70:1	0.35:1	0.10:1	--	--	--	--	--
San Xavier (3	6.01:1	6.18:1	2.90:1	0.96:1	1.97:1	--	--	--	--	6.72:1
Silver Bell	--	1.41:1	--	1.09:1	1.17:1	--	--	--	--	--
CYPRUS MINES CORPORATION										
Bagdad	1.52:1	1.78:1	1.45:1	1.53:1	0.94:1	0.42:1	0.54:1	0.77:1	1.96:1	1.23:1
Bluebird (5 (6	1.50:1	0.003:1	--	--	--	--	--	--	--	--
Christmas (7	4.40:1	3.24:1	--	--	--	--	--	--	--	--
Esperanza (8	0.76:1	1.95:1	--	--	--	--	--	--	--	--
Johnson	2.01:1	1.52:1	--	0.03:1	--	--	--	--	--	--
Miami (7	2.40:1	1.53:1	1.42:1	0.27:1	1.72:1	1.50:1	1.82:1	2.04:1	2.01:1	0.96:1
Mineral Park (8	1.71:1	1.44:1	--	--	--	--	--	--	--	--
Sierrita (8	1.11:1	0.98:1	0.55:1	0.33:1	0.76:1	0.55:1	0.19:1	0.40:1	0.67:1	0.77:1
Twin Buttes (9	3.32:1	3.62:1	2.05:1	1.14:1	--	--	--	--	34.60:1	8.37:1
MAGMA										
San Manuel Oxide	--	--	--	--	--	--	1.70:1	2.46:1	2.32:1	2.45:1
Pinto Valley	1.07:1	1.77:1	1.80:1	--	0.79:1	1.01:1	1.21:1	1.32:1	1.39:1	1.53:1
PHELPS DODGE CORPORATION										
Metcalf	1.67:1	--	--	--	--	--	--	--	--	--
Morenci (10	1.30:1	1.63:1	0.79:1	0.64:1	0.90:1	0.68:1	0.76:1	1.10:1	1.13:1	1.22:1
New Cornelia	2.27:1	0.48:1	1.21:1	0.30:1	0.58:1	--	--	--	--	--
WEIGHTED AVERAGE*	1.90:1	1.57:1	1.31:1	0.57:1	1.10:1	0.88:1	0.96:1	1.21:1	1.49:1	1.46:1

(continued)

TABLE VIII (CONT'D)

STRIPPING RATIOS AT ARIZONA OPEN-PIT COPPER MINES *(1*

(Waste:Ore)

(1 Leachable rock included with waste (except at solely leach operations).
(2 Mining was done by ASARCO, includes ANAMAX's share of ore.
(3 Combined as Mission Complex in 1985.
(4 Ray Unit acquired from Kennecott, November 18, 1986.
(5 Stripping of overburden ceased in Janu. y 1981, but mining continued until July.
(6 Bluebird Property acquired by Inspiration in 1984 and by Cyprus as part of Cyprus Miami, July 1, 1988.
(7 Acquired from Inspiration, July 1, 1988.
(8 Sierrita, Esperanza and Mineral Park acquired from Duval, April 1, 1986.
(9 Acquired by Cyprus, March, 1988.
(10 Combined Morenci and Metcalf 1981 et. seq.

Source: "Minerals Yearbook - Area Reports: Domestic", U.S. Bureau of Mines; Company Annual Reports; *E&MJ International Directory of Mining and Mineral Processing Operations*; Arizona Department of Mines & Mineral Resources; Company submitted data beginning in 1985.

***NOTE:** These are now weighted averages so use caution in making comparisons to the averages presented in previous editions of this report prior to 1981.

TABLE IX

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLYBDENUM, GOLD AND SILVER RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 1,000 lbs. Value (in $1,000)	Copper (2 Pounds Value	Copper (2 Lbs. Cu/ton ore Ave.¢/lb. (5	Value of Copper Gold, Silver & Molybdenum
1972	165,914,825	102,526	6,614,957	27,126	1,695,858,000	10.22	
		5,987,518	11,143,226	46,791	858,392,446	50.617	922,314,190
1973	181,311,945	102,376	7,164,988	37,657	1,735,012,000	9.57	
		10,013,397	18,325,173	59,372	1,021,314,814	58.865	1,109,025,384
1974	178,913,296	90,206	6,308,721	28,346	1,609,808,000	9.00	
		14,488,424	29,701,332	57,067	1,233,901,735	76.649	1,335,158,491
1975	168,750,152	82,759	6,190,805	25,030	1,502,978,000	8.91	
		13,364,751	27,354,196	61,411	954,917,072	63.535	1,057,047,019
1976	194,136,559	97,961	7,308,395	31,073	1,912,430,000	9.85	
		12,276,473	31,816,805	89,148	1,316,210,823	68.824	1,449,452,101
1977	168,641,401	87,874	6,696,415	34,574	1,705,240,000	10.11	
		13,032,593	30,957,660	120,497	1,122,184,339	65.808	1,166,295,089
1978	178,204,491	92,508	6,611,781	33,029	1,817,670,000	10.20	
		17,905,108	35,709,502	150,142	1,190,755,617	65.510	1,244,520,369
1979	203,977,408	99,549	7,454,306	35,101	1,914,501,095	9.39	
		30,622,766	82,699,941	213,065	1,767,735,441	92.334	2,094,081,895
1980	169,650,401	71,533	5,640,703	36,299	1,521,850,812	8.97	
		43,814,606	116,376,559	324,150	1,543,400,219	101.416	2,027,741,384
1981	216,787,430	95,496	7,565,368	35,600	2,143,898,000	9.89	
		43,891,299	79,575,340	273,052	1,795,385,941	83.744	2,191,904,580

(continued)

TABLE IX (CONT'D)

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLYBDENUM, GOLD AND SILVER RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 1,000 lbs. Value (in $1,000)	Copper (2 Pounds Value	Copper (2 lbs. Cu/ton ore Ave. ¢/lb. (5	Value of Copper Gold, Silver & Molybdenum
1982	146,124,870	61,050	6,301,000	22,099	1,697,500,000	11.62	
		22,949,000	50,090,000	100,673	1,261,415,000	74.31	1,435,127,000
1983	152,902,150	61,991	4,492,000	23,934	1,495,208,000	9.78	
		26,284,000	51,383,000	79,459	1,144,285,000	76.53	1,301,411,000
1984	145,278,431	51,548	4,093,000	23,184	1,582,549,000	10.89	
		18,591,200	33,320,000	78,827	1,044,483,000	66.00	1,175,151,000
1985	159,547,970	52,053	4,885,000	30,428	1,778,334,456	11.14	
		16,585,000	30,007,000	98,827	1,166,571,000	65.60	1,311,990,000
1986	153,439,000	63,334	4,202,000	29,382	1,752,525,000	11.42	
		23,370,000	22,987,000	75,607	1,157,543,000	66.05	1,279,507,000
1987	166,113,000	48,430	3,530,000	15,939	1,724,068,000	10.38	
		21,694,000	24,745,000	51,802	1,370,924,000	79.52	1,469,165,000
1988	175,261,000	67,000 (e	4,742,000	29,132	1,885,112,000	10.76	
		29,579,000	31,000,000	78,074	2,243,283,000	119.00	2,381,637,000
1989	196,684,000	69,000 (e	4,926,600	29,795	2,009,782,000	10.22	
		26,524,000	27,236,000	99,545	2,592,723,000	129.01	2,746,028,000

(continued)

TABLE IX (CONT'D)

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLYBDENUM, GOLD AND SILVER RECOVERED FROM COPPER ORE

(1 Molybdenum content of recovered concentrate.
(2 Excludes precipitate copper from dump and in-place leaching prior to 1982.
(3 At average annual domestic, free market gold price.
(4 At E&MJ average annual N.Y. market price for .999 fine silver.
(5 At E&MJ average annual price, U.S. Producer Cathode Preliminary.
(e Estimated
(p Preliminary.

Source: Table I, this publication - U.S. Bureau of Mines State Mineral Summaries.

TABLE X

NONFUEL MINERAL PRODUCTION IN ARIZONA[1]

MINERAL	1988 Quantity	1988 Value	1989 (p Quantity	1989 (p Value
Clays ----------short tons -	185,620	$1,590	211,580	$2,010
Copper [2 ----------metric tons --	845,445	2,246,093	890,940	2,592,793
Diatomite ----------short tons --	8,000	1,208	8,100	1,208
Gem Stones ----------	NA	3,300	NA	3,300
Gold [2----------kilograms --	4,549	64,106	2,849	35,264
Lime ----------do. --	674	29,637	W	W
Perlite --------thousand short tons --	W	W	W	W
Pumice ---------thousand short tons --	1	7	--	--
Sand and Gravel:				
Constructon ----------	32,399	123,854	33,800	133,500
Industrial ----------	119	3,045	W	W
Silver [2 ----------metric tons-----	152	31,974	153	27,236
Stone:				
Crushed -----thousand short tons --	7,400(e	33,000(e	5,300	26,200
Dimension ----------short tons --	W	1(e	W	1
Combined value of cement, lead (1988), molybdenum, pyrites, salt, tin (1988-89), and values indicated by symbol W ----------	XX	235,596	XX	368,824
Total ----------	xx	2,773,411	XX	3,190,266

(e Estimated.
(p Preliminary.
NA Not available.
W Withheld to avoid disclosing company proprietary data; value included in "Combined value" figure.
XX Not applicable.
(1 Production as measured by mine shipments, sales, or marketable production (including consumption by producers.
Source: "The Mineral Industry of Arizona in 1989" Mineral Industry Surveys, U.S. Bureau of Mines.

TABLE XI

ESTIMATED

COPPER MINE CAPACITY IN ARIZONA *(1*

(Short tons of Recoverable Copper/Year)

OPERATOR	MINE	CAPACITY *(2*
Phelps Dodge	Morenci/Metcalf	300,000 *(a*
Magma	San Manuel	130,000 *(a*
Cyprus	Sierrita/Esperanza	120,000 *(b*
Asarco	Ray	115,000 *(c*
Cyprus	Bagdad	100,000 *(a*
ASARCO	Mission Complex	87,000 *(c*
Magma	Pinto Valley	85,000 *(a*
Cyprus	Inspiration Area	62,000 *(c*
Magma	Superior	42,000 *(d*
Phelps Dodge	New Cornelia	40,000 *(d*
Cyprus	Mineral Park	17,000 *(d*
Magma	Miami & Miami Tails	14,000 *(a(b*
Cyprus	Christmas	8,000 *(d*
ASARCO	Silverbell	4,000 *(e*
Kocide	Van Dyke	3,000 *(b*
Cyprus	Casa Grande	2,000 *(e*
Phelps Dodge	Copper Queen	2,000 *(e*
TOTAL		1,131,000

(1 Figures generally represent a current estimate of the productive capacity of primary recoverable copper in concentrates, precipitates, and cathodes. Figures do not represent smelter or refinery capacity. The estimates are based on recent production figures and on capacities of concentrator and leach plant facilities. Other factors affecting actual production include, for example, grade of ore and recovery. Some capacities have been published by the reporting company. Capacities for shut down operations are historic and not necessarily immediately available.

(2 Basis of capacity estimate
(a Recent production figures
(b Design capacity & ore grade
(c Company annual report or 10K
(d Historic data
(e Leaching only

Source: Arizona Department of Mines & Mineral Resources file data; Company Annual Reports and Form 10-K; Professional Publications.

TABLE XII

COPPER SMELTERS
North America

End of 1989-Short Tons

Company	Location Of Plant	Annual Capacity
UNITED STATES		
ASARCO Incorporated		
El Paso Smelter	El Paso, TX	450,000
Hayden Smelter	Hayden, AZ	720,000
Hayden-Ray Smelter	Hayden, AZ	360,000
Chemetco Inc.	Alton, IL	150,000
Copper Range Company	White Pine, MI	70,000
Cyprus Miami Mining Corporation	Claypool, AZ	408,000
Kennecott Corporation		
Kennecott Utah Copper	Garfield, UT	820,000
Magma Copper Company		
San Manuel Division	San Manuel, AZ	1,059,000
Phelps Dodge Corporation		
Chino Mines	Hurley, NM	550,000
Tyrone Branch	Playas, NM	750,000
Total (a)		**5,337,000**
CANADA		
Falconbridge Ltd.	Falconbridge, Ont.	700,000
Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon, Manitoba	340,000
Inco Ltd.	Copper Cliff, Ont.	1,300,000
Noranda Mines Inc.		
Gaspe Smelter	Murdochville, Que.	240,000
Horne Smelter	Rouyn-Noranda, Que.	900,000
Total (a)		**3,980,000**
MEXICO		
Compania Minera De Cananea, S.A.	Cananea, Son.	277,000
Industrial Minera Mexico, S.A.	San Luis Potosi	42,000
Mexicana De Cobre, S.A. De C.V.	Nacozari, Sonora	672,000
Total (a)		**991,000**

Source:American Bureau of Metal Statistics Inc.
The capacity of copper smelting works is given as estimated by the respective propriet
(a) Tons of material.

TABLE XIII

COPPER PRODUCTION BY COMPANIES (g

Short Tons

	1985	1986	1987	1988	1989
UNITED STATES					
Anamax Mining Company	9,864	--	--	--	--
ASARCO Incorporated	85,470	98,200	194,800	206,000	235,700
Cominco American Incorporated And Dresser Minerals (e	1,192	1,892	1,925	1,671	1,489
Copper Range Company (f	--	31,298	53,053	45,802	52,061
Cyprus Bagdad Copper Corp.	83,671	86,920	91,340	100,298	99,318
Cyprus Casa Grande Corp. (m	--	--	879	2,150	2,512
Cyprus Johnson Copper Company	3,100	2,436	--	--	--
Cyprus Miami Mining Corp. (o	(d)	(d)	(d)	30,658	62,184
Cyprus Mineral Park Corp.	--	--	2,203	2,214	1,728
Cyprus Pinos Altos Corp.	--	--	130	4,189	1,398
Cyprus Sierrita Corporation	110,690	56,089	78,985	87,579	80,934
Cyprus Tonapah	--	--	--	144	1,004
Cyprus Twin Buttes	--	--	--	6,010	44,373
The Doe Run Company	--	--	13,018	22,936	20,220
Hecla Mining Company (a	749	346	289	481	460
Coeur Mine (j	61	62	58	47	50
Galena Mine (k	154	141	121	125	129
Lucky Friday Mine	534	143	110	309	281
Inspiration Consolidated Copper Company (f	40,402	32,085	35,582	(d)	(d)
Kennecott Corporation (l	235,000	190,000	60,000	245,000	244,000
Magma Copper Company (n	199,481	210,057	197,013	200,753	214,388
Pinto Valley Division	90,839	97,544	75,550	78,550	91,781
San Manuel Division	108,642	112,513	121,463	122,203	122,607
Montana Resources	--	8,876	30,856	53,155	39,634
Noranda Lakeshore Mines, Inc. (b	6,779	3,581	--	--	--
Phelps Dodge Corporation (U.S. mines) (b	410,076	405,400	468,900	451,800	515,495
Tennessee Chemical Company	8,450	7,475	4,560	--	--
Refiners (c					
AMAX Copper, Inc.	28,508	--	--	--	--
ASARCO Incorporated	414,197	441,600	447,700	484,700	492,800

Source: American Bureau of Metal Statistics Inc.

(a Includes Hecla's share of production from each mining property.

(b Includes copper produced from purchased ores.

(c The totals for these concerns are to a large extent duplications of the reports of other producers.

(d Starting in 1988, Cyprus Miami Mining Corp.

(e Magmont mine.

(f Refined production.

(g Copper content of mine production unless otherwise noted.

(j Operated by ASARCO - Shows Hecla Mines share of 5%.

(k Operated by ASARCO - Shows Hecla Mines share of 25%.

(l Reported production of refined copper plus unrefined copper sales. Includes only Kennecott's share from jointly owned properties.

(m Formerly Noranda Lakeshore.

(n Refined copper contained in concentrates produced and SX-EW production.

(o Formerly Inspiration Consolidated Copper Company.

TABLE XIV

Copper Imports Of The United States By Countries

Copper Content-Short Tons

	1985	1986	1987	1988	1989
Ores, Concentrates Mattes & Cement	7,710	5,977	12,765	9,101	52,264
Canada	2,820	2,147	4,093	178	--
Mexico	19	--	6,753	6,822	47,581
Honduras	83	--	--	--	--
Argentina	--	18	--	--	--
Bolivia	--	--	7	--	--
Chile	77	71	--	34	3,931
Peru	1,265	1,431	1,474	55	--
Venezuela	664	--	--	--	--
Ireland, Rep.of	--	--	--	1	--
Monaco	--	--	--	--	76
Sweden	--	--	--	--	661
United Kingdom	--	--	--	--	3
Japan	524	639	--	--	--
Mozambique	--	--	--	--	12
Australia	2,150	1,671	438	2	--
Papua New Guinea	--	--	--	2,009	--
Other Countries	108	--	--	--	--
Blister & Anodes	28,635	51,049	47,991	108,505	85,117
Canada	2,559	3,248	15	--	207
Mexico	2,117	20,068	15,457	1,145	7,325
Chile	19,823	27,409	21,532	53,206	37,161
Peru	3,819	--	2,921	3,282	3,254
Germany, F.R.	72	269	95	--	--
Switzerland	--	--	--	2	--
Japan	--	--	2,189	32,150	24,580
Cape Verde	--	--	--	--	821
Ivory Coast	--	--	--	5,647	--
South Africa	--	--	5,782	9,815	--
Tanzania	--	--	--	--	1,088
Zaire	--	--	--	3,258	10,681
Zambia	--	55	--	--	--
Other Countries	245	--	--	--	--
Refined Cathodes & Shapes	415,675	541,990	556,973	367,150	333,016
Canada	141,085	219,969	231,078	195,996	199,312
Mexico	1,780	1,419	611	46	181
Brazil	--	--	--	1,319	20,085
Chile	167,548	164,436	159,915	91,211	85,358
Peru	38,714	59,035	46,716	14,848	10,186
Venezuela	--	--	--	137	--
Austria	--	--	--	495	21
Belgium	5,865	2,386	702	1,396	--
Finalnd	--	--	--	441	--
Germany, F.R.	1,209	--	34,680	5,573	310
Netherlands	--	--	7,043	5,567	2,680
Norway	886	--	205	390	61
Spain	--	--	--	3,530	--
Sweden	--	--	16,788	4,157	--
Switzerland	--	--	--	385	--
United Kingdom	3,541	6,381	--	--	21

continued

TABLE XIV (CONT'D)

Copper Imports Of The United States By Countries

Copper Content-Short Tons

	1985	1986	1987	1988	1989
Refined Cathodes & Shapes Cont.					
Yugoslavia	--	--	4,629	2,199	--
Hong Kong	--	--	--	711	--
Japan	5,241	--	661	--	3
South Korea	2,393	--	--	--	--
Taiwan	--	--	300	--	--
Congo (Brazzaville)	--	3,155	--	--	--
Niger	--	--	--	--	912
South Africa	6,453	11,101	5,046	1,985	1,193
Zaire	30,057	39,688	26,446	35,143	12,607
Zambia	9,821	32,714	21,834	--	--
Australia	8	--	--	--	--
Poland	--	--	--	714	--
China	--	--	165	845	71
Other Countries	1,074	1,706	154	62	15
Copper Waste & Scrap	**25,368**	**30,001**	**36,510**	**40,952**	**34,808**
Canada	20,148	22,529	28,302	28,860	21,350
Mexico	3,471	5,692	5,890	8,036	3,933
Bahamas	--	249	23	37	17
Barbados	--	86	67	72	56
Costa Rica	125	127	214	224	594
Dominican Republic	94	265	592	648	515
El Salvador	--	--	167	--	--
Guatemala	43	20	94	205	267
Haiti	--	--	--	--	49
Houduras	49	37	41	53	38
Jamacia	160	128	62	194	207
Netherlands Antilles	--	--	94	139	31
Panama	428	378	431	977	703
Trinidad	97	18	93	209	336
Chile	--	--	--	79	5,296
Peru	--	--	55	--	--
Surinam	--	--	--	48	--
Venezuela	164	1	--	628	648
France	50	40	24	119	--
Germany, F.R.	51	63	--	111	325
Italy	--	--	62	--	--
Netherlands	--	--	--	--	304
Switzerland	14	--	--	--	--
United Kingdom	69	--	24	42	1
South Korea	287	112	124	48	7
Malaysia	--	--	30	--	--
Singapore	--	--	79	--	--
Taiwan	1	--	25	27	--
Other Countries	117	256	17	196	131

(continued)

TABLE XIV (CONT'D)

Copper Imports Of The United States By Countries

Copper Content-Short Tons

	1985	1986	1987	1988	1989
Copper Alloy Waste & Scrap *(a*	35,201	43,008	48,703	55,146	87,435
Canada	22,660	28,303	32,661	31,120	42,720
Mexico	9,781	11,917	11,570	14,180	22,825
Bahamas	--	46	37	--	67
Barbados	--	--	41	--	35
Costa Rica	84	14	40	--	146
Dominican Republic	461	328	464	962	1,177
Guatemala	50	17	82	137	346
Haiti	--	--	--	142	118
Houduras	29	20	2	107	68
Jamaica	140	140	136	204	353
Netherlands Antilles	--	--	257	249	340
Panama	517	731	784	739	935
St. Vincent	--	--	--	--	58
Trinidad	44	41	155	306	332
Chile	99	78	116	1,992	3,690
Peru	--	--	629	144	--
Venezuela	--	--	208	1,040	6,772
Belgium	--	14	43	1,675	1,577
France	59	21	24	--	206
Germany F.R.	133	147	303	251	234
Italy	--	--	163	--	21
Netherlands	--	--	41	--	--
Portugal	--	--	--	--	33
Sweden	--	78	78	--	21
Switzerland	34	--	51	--	47
United Kingdom	306	106	321	290	302
Hong Kong	--	--	--	145	102
Japan	42	--	57	210	336
South Korea	8	325	153	--	95
Malaysia	--	112	54	--	47
Philippines	138	69	--	--	15
Singapore	--	--	114	--	195
Taiwan	165	--	36	358	3,835
China	--	--	--	82	150
Other Countries	194	501	83	813	237

continued

TABLE XIV (CONT'D)

Copper Imports Of The United States By Countries

Copper Content-Short Tons

	1985	1986	1987	1988	1989
Master Alloys	1,017	682	814	889	743
Unwrought Alloys	13,301	17,815	15,812	11,547	4,487
COPPER AND COPPER ALLOY IMPORTS OF BRASS MILL PRODUCTS *(b)*					
Strip, Sheet & Plate					
Copper	46,860	43,985	33,997	37,167	37,859
Copper Alloy	157,729	142,311	114,376	99,981	81,235
Foil					
Copper	35,182	32,653	46,708	44,945	33,957
Copper Alloy	32,880	29,615	29,912	22,677	27,216
Wire					
Copper Alloy	13,009	22,585	23,833	25,028	22,143
Rod, Bar & Other					
Copper	36,875	38,970	31,391	31,474	29,617
Copper Alloy	50,983	55,756	64,579	74,634	75,622
Tube & Pipe					
Copper	64,832	84,963	100,021	91,924	72,896
Copper Alloy	62,251	61,857	57,224	59,493	66,882
					--
Copper Wire Insulated *(c*	83,016	95,201	103,597	106,022	--
Canada	36,393	33,491	34,523	36,111	--
Mexico	6,683	10,528	23,276	24,667	--
Costa Rica	--	2,757	2,350	2,516	--
Brazil	5,904	4,141	3,157	5,371	--
Chile	918	1,444	829	607	--
Peru	5,251	4,499	3,587	5,443	--
Venezuela	--	3,427	3,276	3,425	--
France	2,598	2,538	4,130	2,688	--
Germany, F.R.	921	--	1,171	1,172	--
Italy	3,111	3,011	1,763	807	--
Spain	3,227	4,205	3,728	297	--
Sweden	85	--	--	--	--
United Kingdom	718	--	--	--	--
Yugoslavia	2,595	2,898	3,072	4,777	--
Hong Kong	--	--	113	639	--
Israel	810	--	616	663	--
Japan	3,149	6,862	4,329	2,547	--
South Korea	3,274	5,797	4,914	6,746	--
Taiwan	--	5,563	7,342	5,998	--
Other Countries	7,379	4,040	1,421	1,548	--

Source: American Bureau of Metal Statistics, Inc., U.S. Bureau of the Census
Current monthly data available, report 010, for the above table on an annual subscription basis.
(a) Copper alloy content. (b) Thousands of pounds.(c) Gross weight.
n.a.-Not available at time of publication.

TABLE XV

Copper Exports of the United States by Countries

Copper Content-Short Tons

	1985	1986	1987	1988	1989
Ores, Concentrates, Mattes & Cement	**128,206**	**192,183**	**137,512**	**239,438**	**350,843**
Canada	3,050	6,993	2,013	9,367	15,212
Mexico	--	--	4	2,151	921
Brazil	--	--	--	--	44,651
Belgium	100	--	--	--	4,051
Finland	--	5,096	7,968	1,967	7,982
France	--	--	--	--	110
Germany, F.R.	--	--	976	37,051	15,419
United Kingdom	--	--	--	--	555
Yugoslavia	--	--	4113	--	6,211
India	--	--	--	--	35
Indonesia	--	--	--	--	136
Israel	--	--	--	--	4
Japan	113,352	145,103	109,737	149,762	190,668
South Korea	7,628	15,548	5,681	13,225	37,734
Malaysia	--	--	--	--	170
Philippines	--	--	--	3,511	7,990
Taiwan	4,076	5,505	4,162	3,291	9,605
Australia	--	--	--	--	251
Bularia	--	--	--	--	5,026
Germany, D.R.	--	--	--	8,757	--
China	--	13,771	2,723	10,316	4,028
Other Countries	--	167	135	40	84
Blister & Anodes	**19,817**	**17,598**	**13,600**	**36,023**	**6,035**
Canada	408	437	922	10,818	3,473
Mexico	2,804	--	303	584	117
Chile	--	--	--	--	472
Germany, F.R.	100	--	--	5241	42
Spain	--	100	5	1164	--
United Kingdom	--	--	--	--	43
Hong Kong	6	185	784	740	627
Japan	--	776	4,706	--	175
South Korea	16,177	14,879	5,122	16,279	30
Saudi Arabia	--	--	--	--	114
Singapore	76	94	112	217	122
Taiwan	93	636	521	588	606
Other Countries	153	491	1,125	212	214
Refined Cathodes & Shapes	**53,037**	**16,446**	**20,304**	**64,574**	**147,391**
Canada	6,165	5,357	4,943	4,238	5,215
Mexico	12,729	317	4,674	9,409	8,097
Costa Rica	--	--	--	--	436
Dominican Republic	--	--	46	--	93
El Salvador	--	--	--	--	108
Honduras	--	--	--	--	291
Brazil	53	126	501	56	19
Chile	--	--	--	--	70
Venezuela	27	149	134	--	1,429
Belgium	671	--	391	234	21

continued

TABLE XV (CONT'D)

Copper Exports of the United States by Countries

Copper Content-Short Tons

	1985	1986	1987	1988	1989
France	318	516	535	1,690	760
Germany, F.R.	1,439	1,533	514	1,456	1,430
Italy	--	--	218	4,984	652
Netherlands	19,343	305	276	9,583	731
Switzerland	40	108	49	137	249
United Kingdom	806	2,469	1,185	2,729	1,197
Hong Kong	1,050	661	458	592	644
Israel	30	--	--	--	77
Japan	5,605	--	3,036	14,877	53,544
South Korea	1,146	1,473	2,063	6,755	1,645
Malaysia	--	--	--	512	--
Philippines	--	--	--	106	2
Singapore	--	--	2	1,410	1,328
Taiwan	1,609	2,835	1,178	1,776	55,109
Australia	4	--	--	--	13
China	25	--	--	3,905	14,191
Other Countries	1,977	597	101	155	40
Copper Waste & Scrap	**148,040**	**150,375**	**119,776**	**132,025**	**170,789**
Canada	18,277	15,149	12,273	32,159	41,956
Mexico	13,507	6,488	13,533	12,672	8,639
Brazil	1,875	4,374	3,326	655	892
Venezuela	--	--	217	337	20
Belgium	10,383	3,552	2,154	3,100	3,991
Finland	--	--	97	--	--
France	182	--	--	--	59
Germany, F.R.	18,654	9,385	4,774	10,748	14,570
Italy	7,553	13,585	6,769	920	280
Netherlands	4,395	1,887	406	1,019	3,779
Norway	--	--	--	118	245
Portugal	--	--	--	--	50
Spain	5,292	6,191	8,877	3,725	958
Sweden	234	--	--	--	--
Switzerland		--	--	17	122
United Kingdom	4,303	1,637	822	2,547	1,354
Hong Kong	1,590	6,312	3,656	1,579	1,242
India	1,102	792	545	2,222	1,203
Indonesia	--	--	--	--	456
Japan	14,829	13,835	17,141	17,780	22,411
South Korea	15,284	13,632	10,650	21,540	35,936
Philippines	--	--	1,045	--	133
Singapore	1,062	754	1,262	2,313	134
Taiwan	27,650	51,694	31,791	17,959	25,503
Thailand	8	--	--	--	1
Australia	58	--	157	--	--
China	--	--	210	470	6,666
Other Countries	2,864	1,108	71	145	49

continued

TABLE XV (CONT'D)

Copper Exports of the United States by Countries

Copper Content-Short Tons

	1985	1986	1987	1988	1989
Copper Alloy Waste & Scrap *(a*	160,791	167,121	204,335	220,405	234,284
Canada	26,421	22,628	23,321	26,023	33,069
Mexico	4,239	935	6,308	11,127	16,322
Trinidad	--	--	776	1,053	164
Brazil	401	4,363	7,037	649	1,964
Venezuela	374	--	141	165	99
Austria	--	--	310	--	--
Belgium	6,960	6,187	8,019	9,607	6,466
France	227	--	106	770	837
Germany, F.R.	18,814	5,325	8,513	23,133	43,927
Italy	9,804	21,608	7,177	2,148	5,458
Netherlands	4,315	1,644	885	1,229	3,347
Portugal	--	--	--	--	84
Spain	7,638	8,595	6,911	11,132	4,589
Sweden	1,994	2,587	1,763	1,780	2,319
Switzerland	713	--	180	59	9
United Kingdom	2,296	4,486	2,975	2,974	6,023
Yugoslavia	132	--	--	--	--
Hong Kong	1,285	--	576	227	1,581
India	15,235	18,254	13,079	14,533	28,169
Japan	27,328	28,317	26,522	18,988	20,558
South Korea	13,692	15,837	28,761	48,550	32,151
Philippines	--	--	126	--	92
Singapore	344	--	255	1,254	1,339
Taiwan	16,231	24,153	60,326	43,647	15,732
Thailand	--	--	--	--	118
South Africa	--	--	--	--	98
Germany D.R.	--	--	--	--	127
China	--	--	198	1,146	9,377
Other Countries	2,749	2,202	70	211	265
	COPPER ALLOY CONTENT - SHORT TONS				
Master Alloys	1,565	851	1,127	1,034	631
Unwrought Alloys	11,216	2,714	9,648	8,695	6,651
	COPPER AND COPPER ALLOY EXPORTS OF BRASS MILL PRODUCTS *(b*				
Strip, Sheet & Plate					
Copper	1,733	1,414	1,195	1,903	7,504
Copper Alloy	15,783	11,375	16,809	34,526	18,526
Foil *(c*					
Copper & Copper Alloy	395	662	1,125	5,704	3,694
Copper	n.a.	n.a.	n.a.	n.a.	1,069
Copper Alloy	n.a.	n.a.	n.a.	n.a.	2,625

continued

TABLE XV (CONT'D)

Copper Exports of the United States by Countries

Copper Alloy Content-Short Tons

	1985	1986	1987	1988	1989
Copper And Copper Alloy Exports of Brass Mill Products (cont'd)					
Wire					
Copper Alloy	10,518	11,127	14,556	16,725	8,592
Rod, Bar & Other					
Copper	2,784	2,030	8,204	5,183	34,962
Copper Alloy	14,582	14,879	16,703	24,480	54,537
Tube & Pipe					
Copper Alloy	10,010	11,781	14,218	17,078	44,685
Copper Alloy	9,894	9,651	12,917	20,618	9,436
Wire & Cable, Bare	8,775	7,915	11,237	13,692	n.a.
Insulated Wire & Cable *(d*	54,754	65,217	95,211	128,633	n.a.
Building Wire & Cable	2,265	2,924	2,852	3,245	--
Power Wire & Cable	6,852	6,338	13,610	10,250	--
Communication Wire & Cable	13,489	21,304	30,108	46,625	--
Copper Magnet Wire	2,905	2,279	3,244	4,774	--
Appliance Wire & Cord	5,950	6,311	5,189	8,323	--
Other Insulated Wire & Cable	23,293	26,061	40,208	55,416	--
COPPER EXPORTS OF COPPER IMPORTS OF THE UNITED STATES *(e*					
Blister & Anodes	7	4	--	10	--
Refined Cathodes & Shapes	16,736	692	11	2,261	13,291
Copper Waste & Scrap	693	300	218	523	286
Copper Alloy Waste & Scrap (a)	861	12,531	8,772	609	2,184

Source: American Bureau of Metal Statistics Inc., U.S. Bureau of the Census. Current monthly data available, report 011, for the above table on an annual subscription basis.

(a) Copper alloy content. (b) Thousands of pounds. (c) 1988 data combines copper and copper alloys as well as not backed and backed. 1989 separates copper alloys and includes only not backed. (d) Gross weight. (e) Copper content. n.a. - not available at time of publication.

TABLE XVI

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1948	11,493	41,318,524	3,595	69.13	39,072,204
1949	11,001	40,612,224	3,692	71.00	37,365,611
1950	10,181	41,994,321	4,125	79.33	41,757,273
1951	10,754	47,825,698	4,447	85.52	42,784,388
1952	11,365	54,950,235	4,835	93.14	44,472,522
1953	12,068	62,742,982	5,199	99.98	45,187,838
1954	12,502	65,518,853	5,241	100.79	43,072,894
1955	12,399	71,293,263	5,750	110.58	52,189,728
1956	14,008	83,568,996	5,966	114.73	60,468,580
1957	14,652	85,125,320	5,809	111.71	59,571,834
1958	14,100	74,726,972	5,300	101.93	56,255,809
1959	11,568	72,095,130	6,232	119.85	53,121,545
1960	13,764	90,312,848	6,562	126.19	66,032,439
1961	14,275	97,271,286	6,814	131.04	71,918,991
1962	14,408	101,920,108	7,074	136.04	78,868,147
1963	14,303	104,291,588	7,292	140.23	80,615,132
1964	14,720	113,792,031	7,730	148.65	86,132,039
1965	15,239	122,163,124	8,016	154.16	92,859,535
1966	17,018	137,187,611	8,061	155.02	101,558,298
1967	13,426	108,427,206	8,076	155.31	74,289,203
1968	15,734	136,089,579	8,649	166.33	101,293,963
1969	19,459	173,183,018	8,900	171.15	127,848,828
1970	21,479	201,665,064	9,389	180.56	150,241,000
1971	21,231	211,978,597	9,984	192.00	149,294,000
1972	23,233	254,717,341	10,964	210.85	165,914,825
1973	25,494	291,294,328	11,426	218.89	181,311,945
1974	27,894	340,832,096	12,219	234.98	178,913,296

(continued)

TABLE XVI (CONT'D)

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1975	25,950	363,349,178	14,002	269.27	168,750,152
1976	25,631	405,289,034	15,812	304.08	194,136,559
1977	23,373	398,539,789	16,835	323.75	168,641,401
1978	21,092	397,790,419	18,860	362.69	178,204,491
1979	23,239	494,963,476	21,299	409.60	203,997,408
1980	21,602	510,168,454	23,617	454.17	169,650,401
1981	26,031	687,434,789	26,408	507.85	216,787,430
1982	17,182	487,415,292	28,368	545.53	135,768,647
1983	13,864	395,266,852	28,510	548.29	135,301,652
1984	12,556	387,028,537	30,824	592.77	145,278,431
1985	11,155	349,311,047	31,314	602.19	174,218,218
1986	10,848	326,915,975	30,136	579.54	167,808,000
1987	10,340	299,297,407	28,946	556.65	166,113,000
1988	10,588	348,502,604	33,008	634.78	175,261,000
1989	11,111	383,199,684	34,488	663.23	196,684,000

(1 "Covered Employment" by law includes all employees of employers of three or more persons. Prior 1966 only a portion of the workers in smelting, refining and rod fabrication were included in this table.

Source: This report, Table XVII; "Mineral Yearbook - Area Reports: Domestic", U.S. Bureau of Mines; Research and Statistics Unit, Arizona Department of Economic Security.

TABLE XVII

ARIZONA INDUSTRIES COVERED BY UNEMPLOYMENT INSURANCE

YEAR - 1989

Industry	Average Number of Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage
Copper Mining	9,482	328,677,070	34,663	666.60
Copper Smelting, Refining & Rod Fabrication	1,629	54,522,614	33,470	643.65
TOTAL COPPER MINING & PROCESSING	11,111	383,199,684	34,488	663.23
Other Mining, Quarrying & Processing	1,198	35,637,349	29,747	572.06
ALL MINING, QUARRYING & PROCESSING	12,309	418,837,033	34,027	654.37
Mfg. Except Copper Processing	185,769	5,277,827,127	28,411	546.36
Construction	86,283	1,863,958,365	21,063	415.44
Transportation, Utilities, etc. (2	68,576	1,857,173,700	27,082	520.81
Wholesale-Retail Trade	368,774	5,527,423,816	14,989	288.24
Services, Finance & Misc.	462,824	9,314,116,355	20,125	387.00
Agriculture & Related Services	34,386	407,821,211	11,860	228.08
Federal, State & Local Government	246,305	5,839,022,377	23,706	455.89
TOTAL AND AVERAGES	1,465,226	30,506,179,984	20,820	400.39

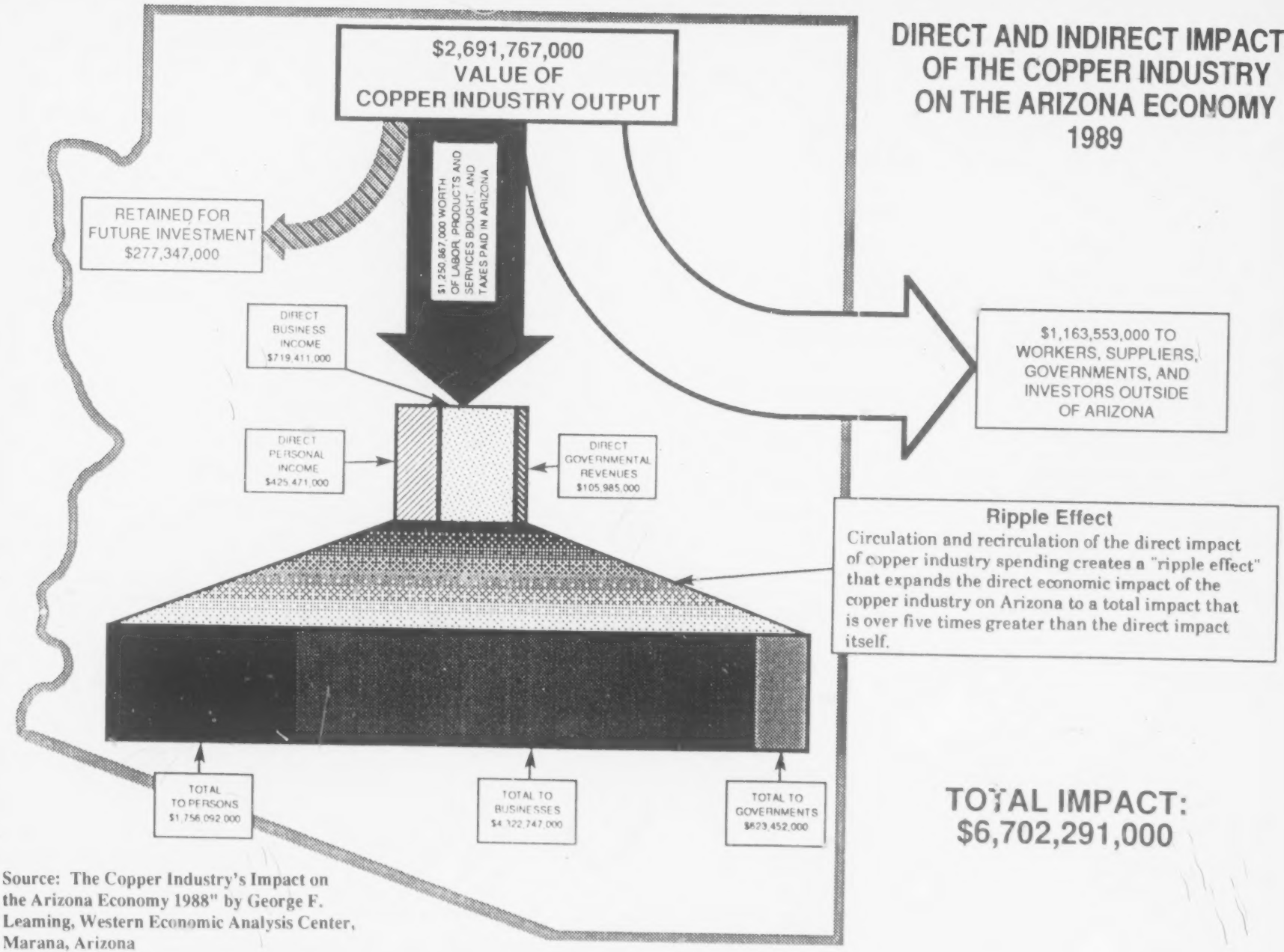
(1 Includes all covered employees.

(2 Transportation exclusive of railroads.

Source: Research Administration, Arizona Department of Economic Security

TABLE XVIII

DIRECT AND INDIRECT IMPACTS OF THE COPPER INDUSTRY ON THE ARIZONA ECONOMY 1989



Ripple Effect

Circulation and recirculation of the direct impact of copper industry spending creates a "ripple effect" that expands the direct economic impact of the copper industry on Arizona to a total impact that is over five times greater than the direct impact itself.

TOTAL IMPACT: $6,702,291,000

Source: The Copper Industry's Impact on the Arizona Economy 1988" by George F. Leaming, Western Economic Analysis Center, Marana, Arizona

TABLE XIX

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING IN THE UNITED STATES AND ARIZONA (1

	All Employees	PRODUCTION WORKERS											
	Average No. (Thousands)	Average No (Thousands)		Average Weekly		Average Weekly		Average Hourly		Average Earnings Per Man		Aggregate Man Hours	
Period	(2 Ariz.	(3 U.S.	(4 Ariz.	U.S.	(5 Ariz.	U.S.	Ariz.	U.S.	(6 Ariz.	U.S.	(7 Ariz.	U.S.	(8 Ariz.	U.S.
1970	18.8	37.0	14.9	29.5	173.01	175.67	43.8	44.7	3.95	3.93	8,997	9,135	33,936	68,570
1971	18.9	34.7	14.9	26.8	178.50	178.46	42.4	42.9	4.21	4.16	9,282	9,280	32,852	59,785
1972	20.5	38.9	16.1	30.7	194.69	192.19	41.6	41.6	4.68	4.62	10,124	9,994	34,827	66,410
1973	21.5	42.3	17.6	33.7	206.75	206.42	41.6	42.3	4.97	4.88	10,751	10,734	38,072	74,127
1974	24.0	42.8	19.1	33.8	222.16	226.46	39.6	41.1	5.61	5.51	11,552	11,776	39,331	72,237
1975	22.5	37.1	17.9	28.4	247.43	247.14	38.6	39.2	6.41	6.33	12,866	12,903	35,929	57,891
1976	21.7	35.5	17.2	27.0	286.31	280.70	40.1	40.1	7.14	7.00	14,888	14,596	35,865	56,300
1977	19.3	35.1	15.3	26.9	302.99	288.73	39.4	38.6	7.69	7.48	15,755	15,014	31,347	53,994
1978	17.2	35.2	13.7	26.9	344.76	338.40	40.8	40.0	8.45	8.46	17,928	17,597	29,066	55,952
1979	19.3	31.9	15.3	24.6	404.81	405.03	42.3	42.5	9.57	9.53	21,050	21,061	33,654	54,366
1980	17.7	29.4	14.0	22.6	446.19	435.01	41.7	41.0	10.70	10.61	23,202	22,621	30,358	48,183
1981	21.9	36.2	17.4	27.9	497.28	492.54	41.2	41.6	12.07	11.84	25,859	25,612	37,278	60,353
1982	15.2	25.3	12.1	18.5	495.60	484.91	38.3	38.7	12.94	12.53	25,771	25,215	24,098	37,229
1983	11.3	18.9	9.0	13.5	519.25	522.69	39.1	39.9	13.28	13.10	27,001	27,180	18,299	28,010
1984	10.5	16.3	8.2	11.4	553.83	562.74	41.3	41.5	13.41	13.56	28,799	29,002	17,610	24,601
1985	9.4	13.1	7.5	9.4	573.80	574.76	41.4	42.2	13.86	13.62	29,838	29,888	16,146	20,627
1986	8.7	11.4	6.9	8.8	582.38	507.99	40.4	41.3	14.42	12.30	30,284	26,415	14,496	18,899
1987	8.6	13.5	6.9	10.7	556.65	492.20	40.1	43.1	13.88	11.42	28,946	25,595	14,388	23,981
1988	8.8	14.4	7.0	11.2	517.74	510.12	41.3	43.9	12.53	11.62	26,932	26,526	15,033	25,567
1989	9.5	14.1	7.5	11.2	561.26	540.44	43.4	45.8	12.94	11.80	29,186	28,103	16,926	26,674

(continued)

TABLE XIX (CONT'D)

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING

IN THE UNITED STATES AND ARIZONA *(1*

	Copper Ore Mined (Thousand Short Tons)		Copper Produced (Recoverable Content) (Thousand Pounds)		Worker Productivity Copper Ore Mined Per Man-Hour (Tons)		Worker Productivity Copper Produced Per Man-Hour (Pounds)	
Period	Ariz.	U.S.	Ariz.	U.S.	Ariz.	U.S.	Ariz.	U.S.
1970	150,241	257,729	1,826,734	3,368,957	4.427	3.759	53.829	49.132
1971	149,294	242,656	1,633,568	2,986,599	4.544	4.059	49.725	49.906
1972	165,815	266,831	1,816,118	3,264,113	4.761	4.017	52.161	49.151
1973	173,605	289,998	1,847,635	3,386,357	4.872	3.912	48.530	45.683
1974	178,821	293,443	1,710,744	3,145,148	4.547	4.062	43.496	43.539
1975	168,656	263,003	1,619,535	2,772,111	4.694	4.543	45.076	47.885
1976	194,046	283,736	2,043,168	3,166,889	5.410	5.040	56.968	56.250
1977	168,601	259,974	1,843,949	2,964,539	5.379	4.815	58.824	54.905
1978	178,201	263,722	1,965,072	2,955,210	6.131	4.713	67.607	52.817
1979	203,977	291,078	2,085,556	3,140,110	6.061	5.369	61.971	57.759
1980	169,650	241,090	1,669,495	2,527,920	5.588	5.004	54.994	52.465
1981	216,787	306,089	2,294,437	3,354,548	5.815	5.072	61.549	55.582
1982	146,125	200,589	1,697,500	2,507,070	6.064	5.388	70.442	67.342
1983	152,902	196,203	1,514,538	2,288,612	8.356	7.005	82.766	81.707
1984	145,278	189,499	1,583,505	2,405,866	8.250	7.703	89.921	97.795
1985	174,218	239,399	1,778,334	2,443,675	10.790	11.606	110.141	118.470
1986	167,808	186,105	1,752,525	2,361,127	11.576	9.847	120.897	124.934
1987	166,113	219,545	1,724,068	2,810,182	11.545	9.155	119.827	117.189
1988	175,261	246,380	1,885,112	3,168,229	11.658	9.637	125.398	123.918
1989	196,684	261,534	2,009,782	3,303,002	11.620	9.805	118.739	123.828

continued

TABLE XIX (CONT'D)

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING IN THE UNITED STATES AND ARIZONA *(1*

(1 Statistics do not reflect workers in copper smelting, refining and rod fabrication.

(2 These figures are estimates made by the Arizona Department of Economic Security, in cooperation with the U.S. Bureau of Labor Statistics, and they include all full and part-time wage and salary workers who were employed in copper mining in any part of the pay periods which included the 12th of each month of the year.

(3 Estimates made by the U.S. Bureau of Labor Statistics, in cooperation with the 50 states, and based upon monthly samplings similar to those in (2 above, adjusted periodically to census bench mark.

(4 Estimates of production (non-supervisory) workers based upon samplings as in (2 above. Since 1975, figures have been calculated by the Arizona Department of Mines and Mineral Resources dividing the annual number of "All Employees-Arizona" by a factor of 1.26. This factor was derived by comparing the annual number of "All Employees-Arizona" with "Production Workers - Arizona" from 1970 to 1974.

(5 Earnings figures for a particular year is the product of "Average Hourly Earnings" and "Average Weekly Hours" for that year.

(6 Gross payroll aggregates, exclusive of irregular bonuses and other pay not earned in a sample pay period, are divided by gross man-hour aggregates of production and related workers for the period in order to determine average hourly earnings.

(7 "Average Weekly Earnings" times 52 weeks.

(8 Number of production workers times "Average Weekly Hours" times 52 weeks.

Source: Table I this publication, American Bureau of Metal Statistics, Research and Statistics Unit, Arizona Department of Economic Security: "Mineral Yearbook - Metals, Minerals", U.S. Bureau of Mines. Employment and Earnings", U.S. Dept. of Labor, Bureau of Labor Statistics, March issues, U.S. Dept. of Interior.

Figure 3. COPPER PRODUCED
(RECOVERABLE CONTENT IN POUNDS)•

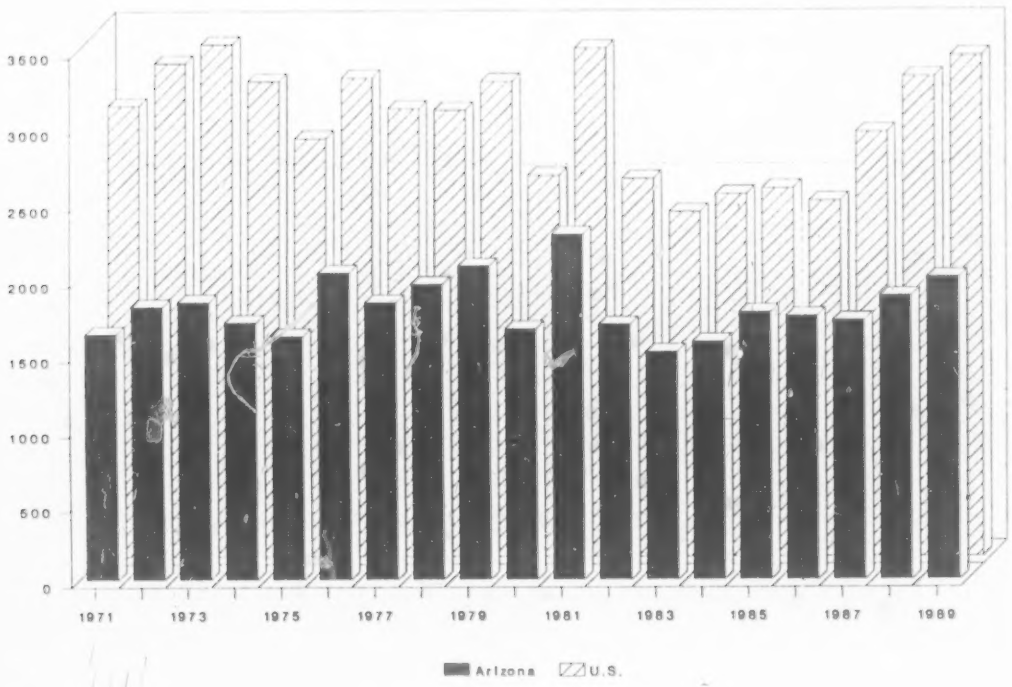
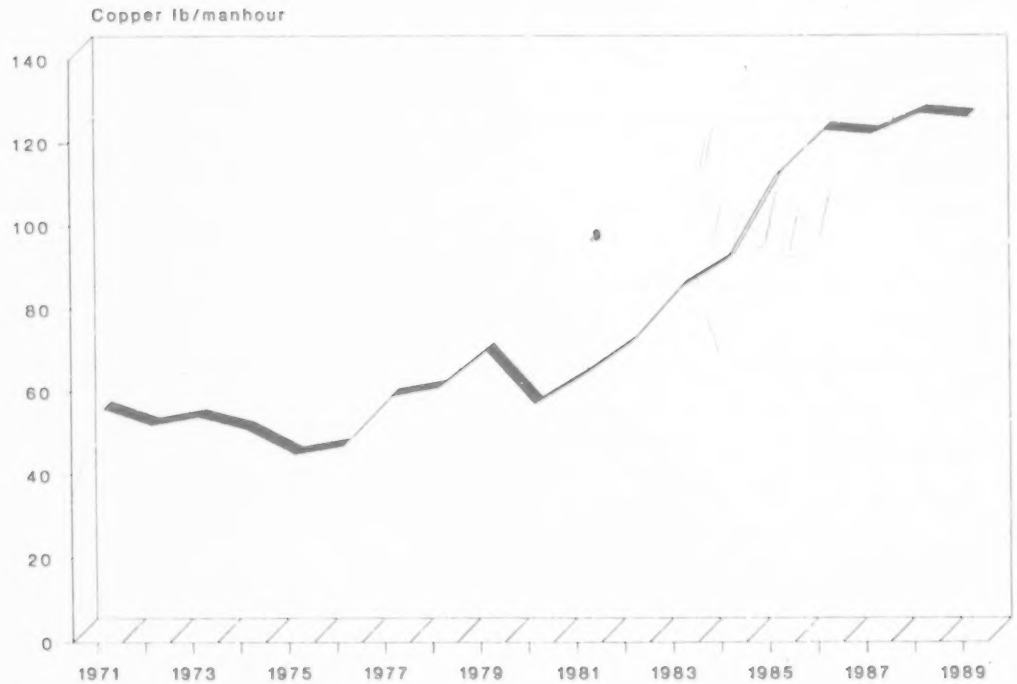


FIGURE 4. PRODUCTIVITY OF ARIZONA
COPPER WORKERS •



• From Table XIX

TABLE XX

REFINED COPPER INVENTORIES AT YEAR END
AMOUNTS IN THOUSANDS OF SHORT TONS

Where Held	1984	1985	1986	1987	1988	1989
U.S. refineries	193.4	150.4	145.1	63.1	42.9	38.4(a
Comex warehouses	276.3	120.3	93.3	18.3	13.4	15.1(b
Total U.S.	**469.7**	**270.7**	**238.4**	**81.4**	**56.3**	**53.5**
Refineries elsewhere	285.7	293.7	280.6	202.6	265.0	284.6(c
LME warehouses	139.3	209.1	193.1	58.3	72.5	108.6(d
Total elsewhere	**425.0**	**502.8**	**473.7**	**260.9**	**327.4**	**393.2**
Aggregate inventories	**894.7**	**773.5**	**712.1**	**342.3**	**383.7**	**446.7**

Source: American Bureau of Metal Statistics as reported in E&MJ. All figures for December 31, 1987.

(a As of November 30, 1989.
(b As of December 22, 1989.
(c As of October 31, 1989.
(d As of December 15, 1989.

TABLE XXI

AVERAGE QUOTED PRICE OF ELECTROLYTIC COPPER WIREBAR DOMESTIC, DELIVERED

U.S. ¢/lb. (1

–	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
JANUARY	119.385	88.570	78.634	80.219	68.792	64.487	69.881	64.986	132.496	152.770
FEBRUARY	133.808	86.071	78.779	84.024	70.748	66.446	68.253	65.525	105.025	140.211
MARCH	106.040	87.382	75.862	82.072	75.311	65.547	70.144	68.071	109.720	148.492
APRIL	94.851	88.033	76.273	83.493	77.388	70.318	68.801	67.129	103.641	143.486
MAY	93.479	85.798	77.948	85.634	72.229	69.864	67.082	70.985	104.373	127.146
JUNE	92.713	85.226	71.488	81.836	69.849	67.094	67.471	74.346	114.275	115.901
JULY	103.565	84.412	71.053	82.947	64.402	66.773	63.815	80.419	104.848	113.487
AUGUST	100.708	87.387	70.999	80.542	64.535	66.284	62.374	82.183	101.451	127.430
SEPTEMBER	98.864	84.722	71.065	77.587	63.408	65.716	64.844	85.607	116.120	138.439
OCTOBER	99.471	82.312	72.413	73.392	62.039	66.680	63.464	88.253	138.048	131.659
NOVEMBER	96.982	81.216	72.968	69.581	65.650	66.294	62.855	108.528	152.320	118.109
DECEMBER	89.127	80.293	74.230	70.805	63.538	68.025	63.630	133.339	161.270	109.216

(1 MW US Producer Delivered.

Source: Metals Week.

Prepared by: State of Arizona Joint Legislative Budget Committee Staff.

TABLE XXII

AVERAGE COPPER CASH PRODUCTION COSTS FOR THE UNITED STATES, 1983-88 *(1*

(Cents per pound of copper)

PRODUCT COSTS	1983	1984	1985	1986	1987	1988
Mine op. cost	22	20	23	23	19	18
Mill-Float op. cost *(2*	24	23	20	21	28	28
Mill-Leach op. cost	7	7				
Smelt/Refine/Transportation	26	24	23	19	14	17
Taxes *(3*	3	2	2	2	2	1
Total Cost	82	76	68	65	63	64
Byproduct Credits	(13)	(11)	(9)	(9)	(10)	(10)
Cash Cost *(4*	69	65	59	56	53	54
Recovery of Capital				11	5	7
TOTAL				67	58	61

(1 Includes 18 mines, most of which were producing from 1983 to 1988.

(2 Includes copper recovered by leaching in 1985 et.seq.

(3 Property and severance taxes and royalties, if applicable.

(4 Includes all cash cost of production and credit for byproducts but excludes depreciation and profit. Costs are in actual dollars for each year shown.

Source: U.S. Bureau of Mines Mineral Yearbook, Volume 1 - Metals & Minerals.

TABLE XXIII

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
ANTLER T17N R16W Sec 4	Standard Metals Corp.	Sulfide	5	1.95	With 4.13% Zn, 0.94% Pb, and 1.05 Ag oz/ton. Annual Report & Form 10-K, 1987. An additional 2.5 million tons reported in 1979 Annual Report.
ATLAS T11S R8E Sec 32	Asarco	Sulfide	5	0.64	Report on the BS&K Project, Pima Co., AZ" by Frank H. Buchella. Cutoff at 0.40% Cu
		Acid Soluble	5	0.37	Cutoff at 0.20% Cu.
		Sulfide	19	0.66	Asarco property adjacent to Atlas.
		Acid Soluble	12	0.38	Asarco property adjacent to Atlas.
BAGDAD T14N R9W Sec 4	Cyprus Minerals Co.	Sulfide	708	0.42	With 0.021% Mo. (includes acid soluble) Form 10-K, 1989.
BUCKEYE EAST T3S R12E Sec 26	Asarco Inc.	Acid Soluble	22	0.65	AZ Mining Assoc. "AZ Wilderness 1988" Report A-23 to Congress.
CACTUS T1N R13E Sec 36	Magma Copper Co.	Mixed	10	0.70	Cactus Prospect Report. Cutoff at 0.2% Cu
CARLOTA T1N R13E Sec 36	Owens, S.B.	Acid Soluble	4	0.85	Reported 1979.
CASA GRANDE T6S R5E Sec 18	Asarco Freeport McMoran	Mixed	352	1.00	Getty Oil Co. Annual Report, 1980. With 0.01% Mo. Cutoff at 0.5% Cu.
CHILITO T4S R15E Sec 22	Asarco Inc.	Mixed	75	0.51	Chilito Mines Report. With 0.01% Mo, 0.04 oz Ag.
CHRISTMAS (OP) CHRISTMAS (UG) T4S R16E Sec 30	Cyprus Minerals Co.	Sulfide Sulfide	7 20	0.63 1.82	Inspiration Resources Form 10-K, 1983 (same as above)

continued

TABLE XXIII (CONT'D)

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
COCHISE T23S R24E Secs 9 & 10	Phelps Dodge Corp.	Acid Soluble	170	0.50	Annual Report, 1987.
COPPER BASIN T13N R3W Sec 20	Phelps Dodge Corp.	Sulfide	175	0.55	With 0.021% Mo. Phelps Dodge Annual Report 1989.
COPPER BUTTE T3S R13E Sec 30	Asarco Inc.	Acid Soluble	22	1.09	AZ Mining Assoc. "AZ Wilderness 1988" Report A-23 to Congress.
COPPER CREEK T8S R18E Sec 11	Magma Copper Co.	Sulfide	80	0.55	Old copper reserves data.
COPPER QUEEN T23S R24E Sec 9	Phelps Dodge Corp.	Mixed	1	5.50	Underground. Phelps Dodge Prospectus May 8, 1975.
DOS POBRES T5S R26E Sec 27	Phelps Dodge Corp.	Sulfide	232	0.89	Form 10-K, 1989, page 7.
DRAGOON T16S R22E Sec 25	Sullivan, James	Acid Soluble	25	0.50	0.5 to 0.6 acid soluble copper.
DYNAMITE T17S R13E Sec 30	Smith, V.A. - Estate	Mixed	100	0.53	Unpublished estimate.
EMERALD ISLE T23N R18W Sec 22	Arimetco	Acid Soluble	2	0.72	Arimetco International, Inc. prospectus May 16, 1990
ESPERANZA T18S R12E Sec 16	Cyprus Minerals Co.	Sulfide	48	0.27	With 0.034% Mo. Pennzoil Form 10-K, 1981.
FOUR METALS T23S R16E Sec 20	Dore Mining & Milling	Sulfide	3	0.82	Iso Mines Ltd. Annual Report, 1965.

continued

TABLE XXIII (CONT'D)

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
GIBSON T1S R14E Sec 21	Lodestar Minerals Inc.	Acid Soluble	11	0.7	43 million tons at 0.40% Cu. Fletcher, J.B. et al report Aug. 1984.
HELVETIA T18S R15E Sec 36	Asarco Inc.	Sulfide Acid Soluble	337 22	0.54 0.55	With Sulfide - 0.088 oz/ton Ag, 0.0005 oz/ton Au.
I-10 T15S R23E Sec 31	Cyprus Minerals Co.	Mixed	100	0.52	Unpublished estimate; with 0.02% Mo.
INSPIRATION AREA MINES T1N R14E Sec 25	Cyprus Minerals Co.	Acid Soluble	252	0.43	Cyprus Minerals Co. Form 10K, 1989 Acquired by Cyprus from Inspiration July 1, 1988.
IRON DOOR T13S R25E Sec 17	Unknown	Sulfide	63	0.38	Spike-E Hills Report. Cutoff at 0.20% Cu.
JOHNSON T15S R22E Sec 26	Arimetco	Sulfide Acid Soluble	9 26	0.60 0.29	Arimetco International Inc. prospectus May 16, 1990
KALAMAZOO T9S R16E Sec 9	Magma Copper Co.	Sulfide Sulfide shaft pillar	211 101	0.77 0.68	Form 10-K, 1987.
KORN KOB T12S R17E Sec 14	Keystone Minerals Inc.	Acid Soluble	2 8	0.53 0.44	North Ore Body. South Ore Body. Holmes & Narrou report on Korn Kob, March 1974 section 5.
LAKESHORE T10S R4E Sec 25	Cyprus Minerals Co.	Sulfide (Porphyry) Sulfide (Tactite) Acid Soluble	41 9 16	0.71 1.35 0.77	Noranda Annual Report, 1984. Noranda Annual Report, 1984. Cyprus Minerals Form 10K 1989

continued

TABLE XXIII (CONT'D)

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
LONE STAR T6S R27E Sec 5	Phelps Dodge Corp.	Mixed	1000	0.41	Phelps Dodge Form 10-K, 1988.
MAGMA MINE T1S R12E Sec 35	Magma Copper Co.	Sulfide	5	5.52	Currently targeted reserves-1.7 million tons at 6.8% Cu with 5% cut-off. Southwestern Pay Dirt"March,1990 pgs.4A-6
MAME T19S R25E Sec 20	Hope Mining & Milling Co.	Acid Soluble	1	1.10	Unpublished estimate.
MIAMI EAST T1N R15E Sec 19	Magma Copper Co.	Sulfide Sulfide	6 50	3.14 1.95	Newmont Mining Annual Report, 1985. Minerals Yearbook 1973, VII Area Rpts USE
MIAMI TAILINGS T1N R15E Sec 30	Magma Copper Co.	Acid Soluble	35	0.33	Magma Form 10-K, 1988. Expect 54% recovery.
MINERAL BUTTE T4S R7E Sec 1	Berry, Julian	Mixed	15	0.42	Cutoff at 0.32% Cu. Bear Creek report.
MINERAL PARK T23N R17W Sec 19	Cyprus Minerals Co.	Sulfide	35	0.17	With .054% Mo. Pennzoil Form 10-K, 1981.
MISSION COMPLEX T16S R12E Sec 31	Asarco Inc.	Sulfide	333	0.67	With 0.13 oz/ton Ag. Asarco Annual Report, 1989.
MORENCI/METCALF T4S R29E Sec 16	Phelps Dodge 85% & Sumitomo 15%	Sulfide Sulfide	707 150	0.79 0.72	Phelps Dodge Form 10K 1989 Western Copper
NEW CORNELIA T12S R6W Sec 27	Phelps Dodge Corp.	Sulfide	209	0.50	Phelps Dodge Form 10-K, 1988.
ORACLE RIDGE T11S R16E Sec 16	Southern Atlantic Ventures Ltd.	Mixed	4	2.23	With 0.67 oz/ton Ag. Additional possible reserves of 4.4 million tons at 2.25% Cu E&MJ - June 1989, pg. 89

continued

TABLE XXIII (CONT'D)

COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
PEACH ELGIN T18S R15E Sec 15	Asarco Inc.	Sulfide Acid Soluble	14 10	0.78 0.75	West, Barbara J. report, January 1980.
PINTO VALLEY T1N R14E Sec 2	Magma Copper Co.	Sulfide Sulfide	404 317	0.39 0.39	Magma Form 10-K, 1988. *Outside of current mine plan.
POSTON BUTTE T4S R9E Sec 33	Conoco Inc.	Mixed	800	0.40	Copper Studies Inc., NYC, March 30, 1979. 500 million tons at 0.50% TCu from Conoco Annual Report, 1972.
RAY T3S R13E Sec 10	Asarco Inc.	Sulfide	642	0.69	Asarco Annual Report, 1989.
RED MOUNTAIN T22S R16E Sec 20	Kerr McGee Corp.	Sulfide	100	0.71	ıcson Daily Citizen, Sept. 23, 1970.
SACATON EAST (UG) T5S R5E Sec 26	Asarco Inc.	Sulfide	15	1.25	Asarco Inc. Form 10K, 1979.
SAN JUAN T5S R26E Sec 35	Claridge, Alf	Acid Soluble	16	0.52	Cutoff at 0.35% Cu or 20 million tons at lower grade with lower cutoff. Producers Minerals corp. Rpt. June 1975.
SAN MANUEL T8S R16E Sec 34	Magma Copper Co.	Sulfide *Sulfide	109 143	0.73 0.64	Magma form 10K, 1988. Cutoff at 0.50% Cu. *Not in current mine plan.
SAN MANUEL OPEN PIT T8S R16E Sec 35	Magma Copper Co.	Acid Soluble Acid Soluble Acid Soluble Sulfide	49 11 261 3	0.42 0.14 0.35 0.90	Open Pit. Open Pit Marginal. In Situ. Magma Prospectus 1989.
SANCHEZ T6S R27E Sec 25	Arizona Copper Co.	Acid Soluble	168	0.34	"S.W. Pay Dirt", June 1989.

continued

TABLE XXIII (CONT'D)

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
SANTA CRUZ T6S R4E Sec 13	Freeport McMoran & Asarco	Acid Soluble	800	0.43	50% joint venture with Asarco. USBM data 1985.
SHEEP MOUNTAIN PROPERTY T8N R2W Sec 13	Mongeau, Ray	Sulfide	350	1.00	To 500 tons, copper content approx. Unpublished estimate.
SIERRITA T18S R12E Sec 7	Cyprus Minerals Co.	Sulfide	563	0.34	With .037% Mo. Cyprus Minerals Co. Form 10-K, 1989. Reserve estimates include Twin Buttes.
SILVER BELL T12S R8E Sec 11	Asarco Inc.	Sulfide	101	0.47	With 0.01 oz/ton Ag. Asarco Annual Report, 1989.
SQUAW PEAK T13N R5E Secs 29 & 30	Squaw Peak Copper May 16, 1990	Sulfide	20	0.36	Roe, Robert R., 1976 report.
STRAY ELEPHANT T4N R20W Sec 31,32	Heinrichs GEO Exploraton Co.	Acid Soluble	4	0.36	Potential of 13 million tons at 0.50% ASCO 1989 report by James Loughry.
STRONG & HARRIS T15S R22E Sec 13	Duram, A. et.al	Mixed	60	0.60	Unpublished estimate with 0.70 Zn.
TURQUOISE T19S R25E Sec 17	Santa Fe Mining	Acid Soluble	15	1.50	.05 oz/ton Au. Northern Miner, June 4, 1990.
TWIN BUTTES T18S R13E Sec 5	Cyprus Sierrita	Sulfide Acid Soluble			Cyprus Minerals Co., Form 10-K, 1989 39 million tons @ 1.00% 11 million tons @0.73%

continued

TABLE XXIII (CONT'D)

COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
UNITED VERDE T16N R2E Sec 22	Phelps Dodge	Sulfide	21	0.52	USGS 1857 D.
VAN DYKE T1N R15E Sec 30	Arimetco	Acid Soluble	100	0.50	Mining Engineering, Dec. 1977.
VEKOL HILLS T10S R3E Sec 4	Tohono O'odham	Sulfide	105	0.56	With 0.014% Mo, 16 million tons acid soluble Cu. Final EIS, Vekol Hills Project, US Dept of Interior, Bureau of Indian Affairs, May 1988.
VENTURA T23S R15E Sec 1	Cyprus Minerals Co.	Sulfide	6	0.26	Iso Mines Ltd. Annual Report, 1965. With 0.28% MoS (6 million additional tons possible)
WHITE MESA T38N R9E Sec 29	Navajo Tribe	Acid Soluble	2	0.75	Mayo, E.B., 1955 report.
ZONIA T11N R4W Sec 12	Zonia Co.	Acid Soluble	35	0.31	Lundin, Richard J. et al, Feb. 1985 rpt.

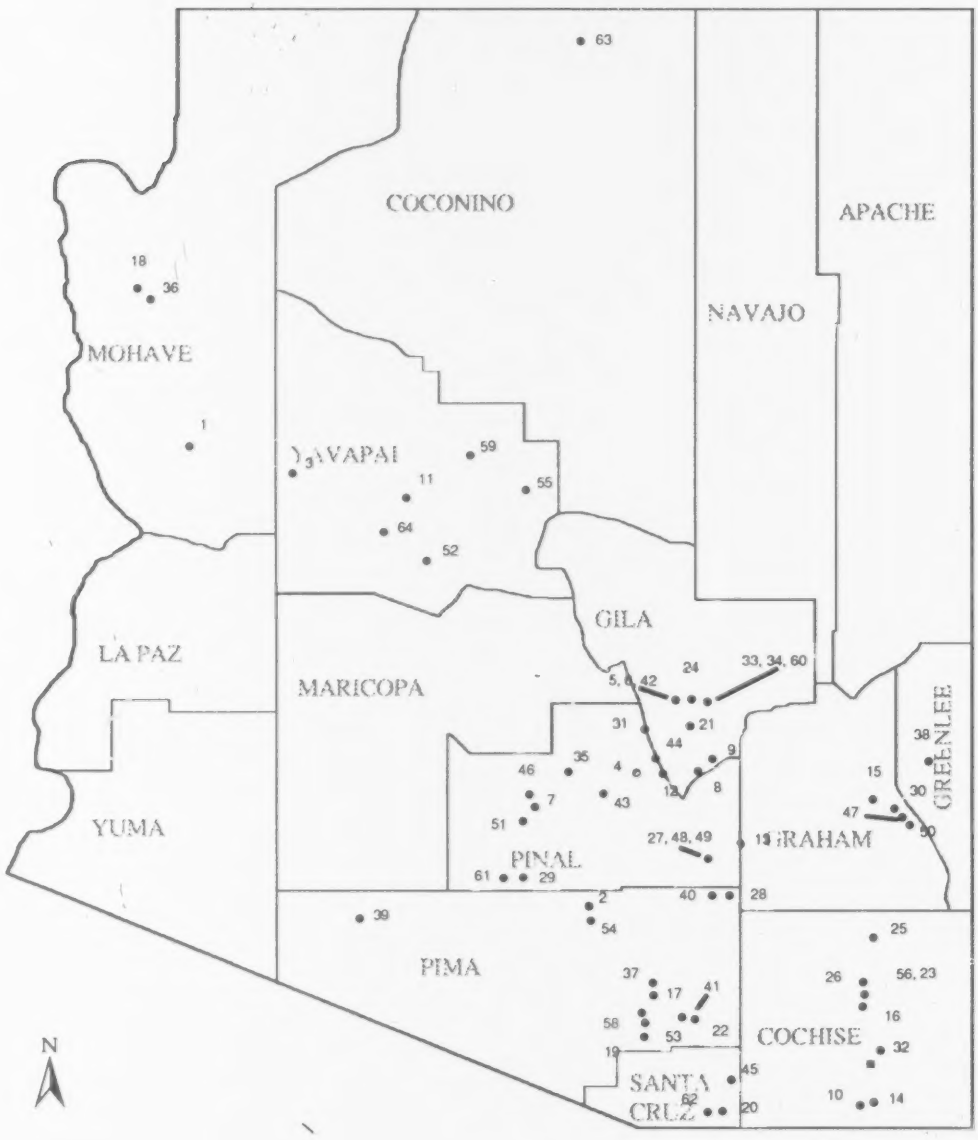
TOTAL COPPER RESERVE BASE IN ARIZONA

Sulfide	6.5 Billion Tons at 0.62% Cu
Acid Soluble	2.1 Billion tons at 0.44% Cu
Mixed	2.5 Billion tons at 0.52% Cu
TOTAL	11.1 Billion tons at 0.56% or 62 million tons of copper

(1 Reserve Base - That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources).
"Mineral Facts and Problems" 1985 Edition, Bureau of Mines Bulletin 675, page 3.

Figure 5. COPPER RESERVES, 1989

1. Antler
2. Atlas
3. Bagdad
4. Buckeye East
5. Cactus
6. Carlota
7. Casa Grande
8. Chilito
9. Christmas
10. Cochise
11. Copper Basin
12. Copper Butte
13. Copper Creek
14. Copper Queen
15. Dos Pobres
16. Dragoon
17. Dynamite
18. Emerald Isle
19. Esperanza
20. Four Metals
21. Gibson
22. Helvetia
23. I-10
24. Inspiration Area Mines
25. Iron Door
26. Johnson
27. Kalamazoo
28. Kom Kob
29. Lakeshore
30. Lone Star
31. Magma Mine
32. Mame
33. Miami East
34. Miami Tailings
35. Mineral Butte
36. Mineral Park
37. Mission Complex
38. Morenci/Metcalf
39. New Cornelia
40. Oracle Ridge
41. Peach Elgin
42. Pinto Valley
43. Poston Butte
44. Ray
45. Red Mountain
46. Sacaton East (UG)
47. San Juan
48. San Manuel
49. San Manuel Open Pit
50. Sanchez
51. Santa Cruz
52. Sheep Mountain Property
53. Sierrita
54. Silver Bell
55. Squaw Peak
56. Strong & Harris
57. Turquoise
58. Twin Buttes
59. United Verde
60. Van Dyke
61. Vekol Hills
62. Ventura
63. White Mesa
64. Zonia



COPPER RESERVES - INDEX BY COMPANY

Company	Deposit
Arimetco	Emerald Isle
Arimetco	Van Dyke
Asarco Inc.	Atlas
Asarco Inc.	Buckeye East
Asarco Inc.	Chilito
Asarco Inc.	Copper Butte
Asarco Inc.	Helvetia
Asarco Inc.	Peach Elgin
Asarco Inc.	Mission
Asarco Inc.	Ray
Asarco Inc.	Sacaton East (UG)
Asarco Inc.	Silver Bell
Casa Grande Copper Co.	Casa Grande
CF & I Steel Corp.	Dragoon
Cochise Mining Corp.	San Juan
Conoco Inc.	Poston Butte
Cyprus Minerals Co.	Christmas
Cyprus Minerals Co.	Bagdad
Cyprus Minerals Co.	Esperanza
Cyprus Minerals Co.	I-10
Cyprus Minerals Co.	Inspiration Area
Cyprus Minerals Co.	Lakeshore
Cyprus Minerals Co.	Mineral Park
Cyprus Minerals Co.	Sierrita
Cyprus Minerals Co.	Twin Buttes
Cyprus Minerals Co.	Ventura
Dore Mining & Milling	Four Metals
Durham, A. et al	Strong & Harris
Freeport McMoran	Santa Cruz
Harpoon, Inc.	Sanchez
Hope Mining & Milling Co.	Mame
Kerr McGee Corp.	Red Mountain
Keystone Minerals	Korn Kob
Lodestar Minerals Inc.	Gibson
Magma Copper Co.	Cactus
Magma Copper Co.	Copper Creek
Magma Copper Co.	Kalamazoo
Magma Copper Co.	Magma Mine
Magma Copper Co.	Miami East
Magma Copper Co.	Miami Tailings
Magma Copper Co.	Pinto Valley
Magma Copper Co.	San Manuel
Magma Copper Co.	San Manuel Open Pit
Navajo Tribe	White Mesa
Owens, S.B.	Carlota
Phelps Dodge Corp.	Cochise
Phelps Dodge Corp.	Copper Basin
Phelps Dodge Corp.	Copper Queen
Phelps Dodge Corp.	Dos Pobres
Phelps Dodge Corp.	Lone Star
Phelps Dodge Corp.	Morenci/Metcalf
Phelps Dodge Corp.	New Cornelia
Rayrock Mines	Kay Copper Mine
Santa Fe Mining	Turquoise
Smith, Ken P. et al	Sheep Mountain
Smith, V.A. estate	Dynamite
Southern Atlantic Ventures	Oracle Ridge
Squaw Peak Copper	Squaw Peak
Standard Metals	Antler
Tohono O'odham Tribe	Vekol Hills
Unknown	Iron Door
Unknown	Mineral Butte
Zonia Co.	Zonia

TABLE XXIV

ARIZONA AND U.S. COPPER MINE PRODUCTION IN SHORT TONS OF Cu, 1874-1989

Period	AZ Production (1	Cumulative AZ	U.S. Production (1	Cumulative U.S.	AZ % of U.S. Prod. Ann'l	AZ % of U.S. Prod. Cum
1874-1971*		24,889,171		60,365,183		41.2
1972	847,929	25,737,100	1,664,840	62,030,023	50.9	41.5
1973	867,506	26,604,606	1,717,940	63,747,963	50.5	41.7
1974	804,904	27,409,510	1,597,002	65,344,965	50.4	41.9
1975	751,489	28,160,999	1,413,366	66,758,331	53.2	42.2
1976	956,215	29,117,214	1,605,586	68,363,917	60.0	42.6
1977	852,620	29,969,834	1,503,964	69,867,887	56.7	42.9
1978	908,835	30,878,669	1,496,482	71,364,363	60.7	43.3
1979	957,251	31,835,920	1,591,200	72,955,563	60.2	43.6
1980	760,926	32,596,846	1,301,900	74,257,463	58.4	43.9
1981	1,071,949	33,668,795	1,695,500	75,952,963	63.2	44.3
1982	848,750	34,517,545	1,264,322	77,217,285	67.1	44.7
1983	747,604	35,265,149	1,144,306	78,361,591	65.3	45.0
1984	822,815	36,087,964	1,215,400	79,576,991	67.7	45.3
1985	878,044	36,966,008	1,218,900	80,795,891	72.0	45.8
1986	878,926	37,844,934	1,180,564	81,976,455	74.4	46.2
1987	862,034	38,706,968	1,384,394	83,360,849	62.3	46.4
1988	942,556	39,649,524	1,584,115	84,944,964	59.5	46.7
1989	1,004,891	40,654,415	1,651,501	86,596,465	60.8	46.9

* For Cumulative Breakdown 1874-1911 and Annual Production 1912-1971, see "The Copper Industry" by Ken Phillips, published Feb. 1973 by ADMMR.

(1 Source: "Mineral Yearbook - Area Reports: Domestic", U.S. Bureau of Mines and Table I this report.

THE ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

The objective of the Department is to promote the development of Arizona's mineral resources. This is accomplished through technical research, field investigations, compilation of information into a mineral occurrence data base and disseminating information through publications, personal contacts and seminars.

The Department's mining engineers and geologists assist mining and exploration companies, prospectors and others interested in Arizona's minerals with mineral processing, mineral land acquisition, exploration, mine development, financing, government regulations and marketing.

The Department is a service agency and does not regulate, tax, or require any type of registration. The agency provides assistance that is tailored to meet the differing needs of the public. The following is a partial list of services which the Department offers:

- Maintain a site specific data base of unpublished reports and maps which includes 5,000 mine files and indexes of 10,000 computerized Arizona
- Maintain an information bank and library of mineral and mining information including a mine map library (hard copy and microfilm), government publications, periodicals, and un-published master and doctorate theses.
- Gather and disseminate information on commodities and markets.
- Suggest target areas for possible exploration activity.
- Suggest prospects and individual properties for study and acquisition.
- Assist individuals and companies in their dealings with State regulatory agencies to facilitate their mining and exploration activity.
- Produce publications in the form of mineral reports, annual directories,technical reports, annual mineral industry surveys and information circulars. These include Laws and Regulations Governing Mineral Rights in Arizona, Directory of Active Mines in Arizona, Manual for Determination of Status and Ownership of Arizona Mineral and Water Rights, and others. A current listing of the Department publications is available upon request.